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THIRD SESSION

OF THE WORLD COMMISSION ON THE ETHICS OF SCIENTIFIC KNOWLEDGE AND TECHNOLOGY (COMEST)

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REPORT OF THE MEETING

Opening ceremony

At the kind invitation of the Brazilian Government, the Third Session of the UNESCO World Commission on the Ethics of Scientific Knowledge and Technology (COMEST) was held in Rio de Janeiro, Brazil, from 1 to 4 December 2003. More than five hundred and fifty registered participants and forty distinguished guests attended the meeting.

This Third Session, the first statutory session held outside Europe, was characterized by a number of scientific debates and political events, and gave the opportunity to examine the work carried out by COMEST during the last biennium. It also provided the Latin American and Caribbean Region with a privileged forum to discuss issues at stake in the earlier areas of activity of the Commission, namely: the ethics of fresh water, the ethics of outer space, the ethics of energy, the ethics of the environment and sustainability, the ethics of scientific education, the ethics of the information society.

This Session also focused for the first time on new themes such as the ethics of nanotechnology, ethics education, an oath and a code of conduct for scientists, the ethical implication of research with human beings in developing countries, and the relationships between the development of science and technology and sustainability.

The Opening Ceremony, attended by a number of Ministers and Senior Civil Servants of the Latin American and Caribbean region, was honoured by the presence of H.E. Mr. **Roberto Amaral**, Minister of Science and Technology of Brazil, who addressed the audience on "Ethics in Scientific Knowledge as an Instrument for the Development and Welfare of People".

He stated that the purpose of COMEST was to promote dialogue between the international community and the public at large. This Third Session, in particular, also constituted an international platform to hold two important political events: the First Regional Ministerial Meeting of South American Science and Technology Ministers and High Officials; and the Second Meeting of the Science and Technology Ministers from the Community of Portuguese-Speaking Countries (CPLP). This session is also a unique opportunity to discuss the framework of the ethics of science and technology for the benefit of humankind. Scientists, researchers, politicians and philosophers are gathered together for the common goal of rendering the use of knowledge more democratic. Knowledge, used by man to change nature and harness its resources to his benefit, should not merely obey a survival instinct but also work towards a higher degree of solidarity. Knowledge advances at a faster pace than the ethical capability to master it, often driven by the appetite to accumulate wealth, the law of the strongest, as well as its corollary. In this view, a code of ethics is to be considered the loftiest law, which could guide human actions.

UNESCO and COMEST have earned the respect of the Brazilian Government and people, for their achievements to remove obstacles to have access to beneficial resources. A policy of change is being implemented by the President of Brazil, which goes hand in hand with UNESCO's work. The need to fight against any form of exclusion is never to be overlooked. And, in the same vein, people should not be excluded from knowledge. This goal can be reached only by joining forces so as to concretize the wish to change. This process of change can only be brought about with the help of scientists and the use of scientific knowledge. The new Brazilian administration has worked hard in this regard. A policy against the barriers hampering the free flow of scientific knowledge and technology has also been put in

place. Without this, people from developing countries will be turned into mere consumers of second hand knowledge, exported by the developed countries. There is a strong need to exchange successful experience and to strengthen solidarity in this field. The exclusion from scientific and technical knowledge of either a part of a country, or of the developing countries, is fully against the ideal of democracy and is to be regarded as unethical. International firms should be more concerned with the survival of individuals instead of with patents. Increasing the frontiers of knowledge, while at the same time lessening the barriers, requires concerted action. This effort requires from the governments a continuous fostering of joined forces, and long lasting work. Major scientific breakthroughs have been recorded in leading fields, such as biotechnology, energy generation, nano-sciences and space technologies, which are the very same fields falling under the scrutiny of COMEST. But there is also a great deal of hypocrisy in these areas. Wealthy nations want indeed to protect their leading position even through the exclusion of others from the knowledge on science and technology they own. Countries which do not engage in capacity building are thus obliged to buy at dear price the technology and knowledge coming from outside. But some of them are not even for sale, as in areas like nuclear energy and space. The same is true for super computer technology, when this is considered to fall under the ban of potential military use. A general plea against the political control of technology is sought, mainly for technologies which are highly needed, as well as for those needed to fight hunger. A proposal is put forth to bring together joint efforts with Portuguese-speaking countries in Africa, to carry out joint projects in this regard, as well as with USA, Europe, and others who share the same problems such as Ukraine and China.

Under the present circumstances, UNESCO finds increasing barriers when it comes to development and social justice. Education should be implemented under trade-driven parameters. There is a need to liberalize access to knowledge and to the benefits of science and technology. Rules have to be found to make the development of science and technology easier. COMEST is to contribute to development, by bringing up studies and rules, which would favor the development for science and technology with social inclusion and the provision of a better life for the people. COMEST gets the full support of the Brazilian Government in building up networks and establishing projects in the interest of the international community. Especially in developing countries, the difference that UNESCO can make is more needed than ever. The importance of COMEST lies in its power to bring about awareness in the process of globalisation. In conclusion, a proposal is made that part of the national debt be reinvested in educational projects to promote the dissemination of scientific and technical knowledge, and the fostering of relationships between those having responsibilities in implementing development policies. In this regard, Rio is to be the nerve center of fruitful reflection proposing solidarity and peace among humanity.

Mr **Jorge Werthein**, UNESCO Representative in Brazil, welcomed all the participants sharing his joy, and that of the UNESCO Office in Brazil, in having made it possible for this Third Session of COMEST to be held in Rio de Janeiro. Having reaffirmed the importance of bringing to the Latin American continent, and to Brazil in particular, the international debate on the ethics of science and technology, he gave the floor to Mr Pierre Sané.

Mr **Pierre Sané**, UNESCO Assistant Director-General for the Social and Human Sciences, having thanked the Government of Brazil on behalf of the Director-General of UNESCO, introduced the work done by UNESCO in the field of ethics of science and technology. Latin America is a priority area for UNESCO for the next two years. Ethics of science and technology is also one of the main priorities of UNESCO. Therefore, the issue of ethics of science in Latin

America is a double priority. UNESCO action in Latin America is focused on four areas: ethics of science, promotion of philosophy and human sciences, the programme Management of Social Transformation (MOST) and the fight against poverty. The ethics of science and technology translates most notably into the effort for education in scientific ethics. The main project is the creation of a Latin American School of Ethics, the first of its kind. Also, education in ethics in higher education will be promoted by means of organizing or supporting academic events and the creation of a UNESCO Chair in Bioethics. UNESCO also provides support in implementing international instruments in national legislations and has a capacity building role in the construction of ethical databases and their dissemination, and the reinforcement of an ethics network, notably between existing national committees. In philosophy and human sciences, UNESCO aims to work for a better understanding of the impact and implications of current changes, and to help create a better social environment by promoting intercultural and philosophical education. The MOST programme focuses on the tools given by social sciences to decision makers in order to improve public social policies. In this regard, UNESCO is working in close cooperation with the permanent forum of the region's social development ministers. The work of MOST also addresses the questions of international migration and multicultural policies, as well as Urban Development. The management of social transformation is of course related to the fight for the eradication of poverty, in which UNESCO works together with social development ministers. With this Programme, UNESCO aims at developing new strategies and tools for analysis of and intervention against poverty and social exclusion, it supports research and it consolidates networks of policy makers and intellectuals. Reflecting on the ethics of science and technology, one should not avoid the issue of its relationship with poverty. There is a long habit of acting as if science were neutral, had nothing to do with social transformations. This is not true. The apparently innocent practice of science, led by universal curiosity and a desire to change human life, has in fact led to the reinforcement of the gap between rich and poor. In the contemporary world, science without ethics is a matter for rich people. Science and technology, instead of being shared and making people closer, tend to be objects of fights and to separate people. From that point of view also, ethics of science is deeply needed. Hence, by meeting in Brazil, we show that ethics of science is not a luxury but a necessity.

Having taken the floor, Mr **Jens Erik Fenstad**, Chairperson of COMEST, thanked everybody and wished to share some reflections on the ethics of science and technology. After the Second World War, science gained almost universal respect, which was turned into a belief in the ability of science to provide solutions to major problems facing nations. Science thus had public trust. The optimistic public perception that advances in science and technology would provide a better future has suffered a severe setback. Indeed, on the basis of the freedom and trust that it enjoyed, the community of scientists have not been fully appreciating and acknowledging the immediate and real challenges of the contemporary world. We are today confronted with a large number of ethical challenges and value conflicts related to new technologies, changing social and human conditions, and the exploitation of the environment.

With scientific progress, new and unfamiliar situations continually emerge, creating circumstances in which our traditional concepts are called into question. Classical notions may no longer seem applicable to reality by the new description offered. Our habitual and accustomed attitudes or ways of life may come to appear threatened. Rapid scientific advancements seem to outstrip our moral sensibility and judgment. The challenges are indeed manifold in fields of interest such as biotechnology, nanotechnology, information and communication technology,

brain and cognitive sciences, environmental sciences and sustainability.

In writing the new social contract between science and society, we have seen a shift from freedom and trust towards issues of responsibility and accountability. This means a new emphasis is put on the ethics of science and technology. Science and technology need to rebuild trust, which is not an easy task. This passes also through an increased responsibility not only of the scientific community as a whole, but also of the individual scientist. A generally recognized code of conduct has been sought many times. The challenge is of course given by the fact that codes and guidelines are measures to a large extent imposed on the community. What is instead most needed is a sense of responsibility and a conviction coming from inside, inasmuch as the ethical responsibility of the scientific community is ultimately borne by the individual scientist.
Science needs to rebuild trust. There is thus an urgent need for openness and dialogue on the complex issues facing science and society. Freedom is a widely shared value. But freedom has a counterpart: duty. This does entail the acceptance of individual responsibility.

On behalf of UNESCO's Director-General, Mr **Marcio Barbosa**, Deputy Director-General of UNESCO, greets all the participants and thanks the Brazilian Government for the way in which the Minister and the Ministry helped in organizing this Session. It is the first time that a formal session of COMEST is taking place outside Europe, inaugurating a new approach to the global debate of the ethics of science and technology by bringing it to the regional level. UNESCO is seeking to listen to the aspiration, the ideas of the Member States outside the old continent. This is totally in line with the reform carried out in UNESCO to fully restore the credibility of the Organization and of the whole UN system. To do this, it is important to be focused and to listen to the ideas coming from elsewhere. Holding the session of COMEST in Brazil also gives a chance to harmonize our action with the work of UNESCO office here, and also to be informed about the efforts carried about by the new administration of the Brazilian Government. Transforming science and technology into a nation-wide project to improve the life of all Brazilians, in particular those who are deprived, is a laudable project. In this respect, UNESCO would respond favorably to any Governmental proposal, and will become a partner of the country.

Prof. **Eduardo Portella**, Chair of the Organization for the Development of Science and Culture (ORDECC), former Chair of UNESCO's General Conference, Former Minister of Education and Culture of Brazil, gave a Keynote Address on "Ethics, International Cooperation and Development - the Role of Science and Technology in the 21st Century".

This issue is at the borderline between science and humanities. Indeed, every time we discuss the current status of science, or try to assess the impacts of technological development, we are also considering the future of humanity. Our sense of alarm rises as time goes by and we take stock of our losses. All that we need is to open the way for socio-historical agents of human self-determination. There is clearly no way out unless the human is allowed by science to remain human and, in turn, allows science to continue thriving.
Humans are ethical animals facing threats from every side. Science progresses in response to human aspirations that continue to rise as history unfolds. What will remain of man if technological controls are indiscriminately accelerated? It is not a matter of seeking a definitive moral cure, but of pursuing the healthiest ethical therapy, the highest degrees of forward-looking immunities. To what extent do the discoveries relating to molecular genetics, biotechnology and informatics reduce or remove responsibility from the human project?

Science needs the critique of culture to enlarge its horizon of legitimacy and to denounce the symbolic reification of the world of life. The idea of progress has long ago overcome the idea of

future and imposed its own rigid agenda. In the same line, the idea of development has abandoned its very own sense of enhancement and happiness to the notions of accumulation and profit. Science is not exempt from responsibility in this dilapidation. The new encounter of science with ethics shall be a relationship of shared responsibility. From here can arise a culture that demands and respects the human rights of the 'other', forged through freely consensual alliances, ethical and inter-ethnic contracts. The sciences have a significant role to play in the building and rebuilding of the history that is just beginning.

Session on Ethics Education

Mr Jens Erik Fenstad, Chairperson of COMEST, introduced the debate and the speakers: Mr Føllesdal is Professor of philosophy at the University of Stanford, USA. Mr Szawarski teaches ethics and philosophy at the University of Warsaw, Poland. Ms Borovecki heads the Master Programme in Ethics in the University of Zagreb, Croatia. Mr José Maria Cantú is President of the Latin American Network of Human Genome Studies, and Mr Volnei Garrafa, Professor at the University of Brasília and President of the Brazilian Society of Bioethics. Mr Fenstad emphasized the special responsibility of COMEST in ethics teaching and briefly recalled the history of the COMEST working group on the teaching of ethics, chaired by Mr Føllesdal. He drew particular attention to the report of this working group.

Mr **Dagfinn Føllesdal** stated first his satisfaction at the worldwide support for ethics, in particular the involvement of UNESCO. The problem, he said, is how to do it right? Otherwise, the support would gradually vanish. New issues arise from the development of science and technologies, notably the speed of changes, the growing integration of cultures and the subsequent risk of moral reaction or the magnitude and number of consequences of the development of science and technology. He quoted the example of biotechnology development. Ethical intuition proves not very reliable with these issues; traditional ethics gives few indications as to what should concretely be done or not. Ethics teaching could become indoctrination. Therefore, one can wonder what room there is for argumentation. There has been a tradition in the 20th century that denied that there could be ethical argumentation. The positivists, for instance, said ethics was not cognitive. Existentialists such as Sartre, said ethics is only about taking a position, defending what you consider right. On the other hand, there is the idea of the importance of ethical *feeling*. But, given the complexity and novelty of the issues considered, this does not seem like a sufficient indication of what is ethical or not. Hence there is a significant case for arguments. Arguments are first a good way to determine what is right or wrong. Second, argumentation is respect: it manifests the will to convince rather than impose views. Also, argumentation forces us to ask the question of consequences, with two subquestions: who will be affected? And how will they be affected? We equally have to address the question of alternatives: what are they? How can they be compared? Ethics cannot be limited to behavioral rules. It is obviously helpful, but not sufficient. Rules cannot replace awareness and responsibility. Ethics also demands a double competence, Mr Føllesdal added: scientific (to determine alternatives and consequences) and ethical (to specify and compare different ethical factors). He gave the example of the Norwegian experience in ethics teaching. All students should study ethics to some extent. This is compulsory in some universities, like Harvard. This should include primary education, and institutions like UNESCO should promote the teaching of teachers, especially regarding funding. Certification will also be needed. Such certification would address the curriculum itself, the program, but also the type of exchange between educators and students. In particular, it should be guaranteed that students have to write essays, and receive comments in return on their work. This implies a sufficient number of teachers compared to the number of students (some universities claim one teacher for ten students), and this hence means human and financial resources. Prof Føllesdal concluded by wishing all success to UNESCO in its effort for teaching ethics, and in particular to the Latin American school of ethics.

Mr **Zbigniew Szawarski** made a presentation entitled "Moral uncertainty and Teaching Ethics". In his introduction he stated that, if we have moral knowledge, then, theoretically at least, we should teach it the way we teach mathematics or physics. But precisely, he assumes that there is no moral knowledge, and yet we must teach ethics. What is the best way to do it? Mr Szawarski proposed to start from simple facts to answer this question. The facts are the following: a) we have similar biological needs, but we differ in individual wants, needs, and desires; b) there are limited natural resources, for instance water; c) we have limited and unreliable information about the world, for instance about the greenhouse effect; d) people differ with regard to their intelligence and knowledge; e) people differ with regard to their sympathies and opinion. The questions asked in ethics are notably: a) What is the nature of values? There is still a lot of disagreement about it; b) are there any universal moral values? c) How to distinguish between moral and non-moral values? d) What if values are incompatible? e) What if they are incommensurable?
On the whole, the idea that there is a common ethic is therefore highly challenged. The idea of moral knowledge faces the dilemma of cognitivism vs. non-cognitivism: is there a possibility of moral knowledge, an objective moral value system, a moral law that we would be able to discover? Or, on the other hand, should the possibility of moral values be denied? This debate could be rephrased: moral monism vs. moral pluralism. In moral monism, there is only one value (virtue, God, life, etc.) absolutely prevailing and overriding. In moral pluralism, there is no overriding moral value but rather different ideas of good life. In moral pluralism, all values are only conditional, and moral uncertainty is a natural feature of human condition. If moral pluralism is the better theory, how can we teach moral ethics? One can identify three different types of ethics, namely: descriptive ethics, moral philosophy, normative ethics. The question is then to know how normative ethics can be taught, where is the frontier between indoctrination and education? How might we teach standards?
The situation in Central and Eastern Europe, Mr Szawarski said, is that there is a tradition of moral monism and the need of a moral authority. The culture of moral pluralism is only arising and beginning. Ethics is more and more developed as the practice of negotiations and compromises. Mr Szawarski concluded by quoting I. Berlin on the danger of believing that some person or group possesses *the* truth.

Ms **Ana Borovecki** made a presentation on the *European master program in health, human rights and ethics*. She explained that this initiative answered to the need to increase access to appropriate, affordable and high quality health care in South Eastern Europe. She listed some advisory bodies of the program, like the World Health Organization Regional Office for Europe, the Council of Europe, the South Eastern European Health Network. She then detailed the role of the Program Committee in determining the curriculum and participating in deliberations for awarding of the Master of Health, Human Rights and Ethics, together with the Examination Committee of the University of Zagreb. The structure of the program consists, like any European master, of 1800 hours of work, 600 are of direct contact between teachers and students, and 1200 are of personal work by students. The structure is made of 17 modules, each of 120 hours. The advantages of having students doing a lot of personal research are that: a) there is more time for preparation; b) the learning process is intensified; c) learning materials are better incorporated, d) teachers are more easily available. The target groups are physicians and health professionals, natural sciences and social sciences specialists, law and philosophy specialists. Ms Borovecki then showed the typical structure of one week of teaching. She also listed the 17 modules, with a mix of theoretical teaching, practical skills courses, and methodology lectures. The students must finally write a scientific paper.

Mr **José Maria Cantú** first invited the audience to change its point of view: he quoted Woody Allen; he reversed the map of the world; he drew

a parallel between the pigmentation of the skin and poverty, between a nuclear bomb and colon cancer. He insisted on the widening gap between rich and poor. To these dramas, he opposed the existence of a "gene of love". Ethics, he said, is the search for love or the love of life. And love is very real, probably genetic. Maternity genes were already discovered, and experience on rats showed that males too have the motherhood instinct. Certain genes cannot be expressed due to the environment and other conditions. The gene, he added, can also be used with the children of others. Best ethics is ethics of love, and it comes from within men. Here we find the reason to fight against all antis.

Mr Cantú concluded that truth has been hidden by sins, and that we must face problems of the world. Like in the cave metaphor of Plato's Republic, we must see reality and not only the shadows.

Mr **Volnei Garrafa** said he wanted to make a more radical presentation than his colleagues. He quoted a fable by La Fontaine to emphasize that symmetry between speakers is needed if there is to be some argumentation. This cannot be the case when there is such inequality between countries that life expectancy in the world goes from 32 (Botswana) to 82 (Japan). Hence, the worldwide ethical debate is biased. For instance, there was in 1999 the same number of persons dying from AIDS and from malaria. But malaria is not a priority in research, because it only kills poor people. The market logic that prevails on these questions, he said, is perverse and one-sided, and leads to unilateral decisions in research and priorities.

This justifies the need for applied, practical ethics that Mr Garrafa advocates. Countries, he said, can and must develop research on methodologies and content in applied ethics. More globally, major political effort is needed, as well as a change in mentalities. This begins clearly with education. The epistemological status of applied ethics must be considered, and the issue of complexity and the necessity of the recollection of knowledge (E. Morin) are particularly relevant. Mr Garrafa then came to the specific discussion on education in ethics, asking himself what should be discussed in secondary education. He mentioned discrimination, social changes, and abortion. He then quoted two studies with teachers, pointing at the need for the reinforcement of ethical values in school and for regional adaptation of the teaching of ethics. In conclusion, Mr Garrafa distinguished between a macro level, with dominant countries maintaining contradictions, conflicts, unfair situations, and the micro level, in which individual initiatives give and manifest hope for a better world. The micro level is, of course, more interesting and should permeate to the macro level, imposing respect for the integrity of individuals.

Session on the Ethics of Fresh Water

The session is chaired by Ms **Pilar Armanet Armanet** (Member of COMEST and Director of Higher Education, Ministry of Education, Chile), who introduces **Lord Selborne**, Chairperson of the COMEST Sub-Commission on the Ethics of Fresh Water.

According to **Lord Selborne**, out of Earth's six billion inhabitants, one billion still does not have access to fresh water, while two billion do not have proper access to sanitation. And this figure is sadly not decreasing. Speaking about the genesis of the UNESCO/COMEST work on the ethics of water, he points out that, after the setting up of the Sub-Commission on the Ethics of Fresh Water, it was clear that, in order to address the ethical issues in the field, there was a need to identify and circulate examples of best ethical practices. A clear source of inspiration for this work was the United Nations 1977 Conference on Water. To carry out the work, a number of ethical principles were used, such as human dignity, participation, and stewardship. Some examples are also given (eg, the Aral sea) as a perfectible paradigm of water resources management.
In sound water management, best ethical practices presuppose a number of core concepts, such as transparency, inclusiveness, empowerment, partnerships, and focus at the local level. In this frame, major stakeholders are international agencies, governments, regulators, public and private local institutions carrying out financial services (often very important), research and development, and technology transfer. Best practice in governance requires linkages between: water administration, health, education, and agriculture. In this regard, the river basin is a natural unit for policy, and it is necessary to adopt an ecosystem approach, without overlooking the need for transparency of data. Relevant technologies are to be used for populations in greatest need. The first requirement is to focus on the household level; use locally relevant solutions such as local materials and local building practices. Then systems with low water requirements should be promoted, as is the case for irrigation and sewerage. As for technology transfer, there are a number of needs, eg promoting networks of information exchange; disseminating information to local decision makers; increasing community involvement, especially of women; and focus on user requirements.
The RENEW (Research and Ethical Network Embracing Water) project was described, with its three nodes in Asia and the Pacific (Camberra), Nordic and Baltic region (Bergen), and Arab States (Cairo). The links with the International Hydrological Programme (IHP) of UNESCO were clarified. The mission of COMEST in the domain of the ethics of freshwater management was then spelled out: to promote engagement in the ethical issues involved in the sustainable use and equitable sharing of fresh water resources at all levels and in the handling of and response to water-related emergencies and disasters. The presentation was concluded by unfolding the way ahead, which includes the identification and endorsement of best ethical practices; the establishment and strengthening of regional networks involving educational and training facilities, water suppliers, regulators, industry, agriculture, and NGOs.

Mr **José Edil Benedito**, Brazilian National Agency of Water (representing Mr Benedito Braga, Director of the Brazilian National Agency of Water and Vice-Chair of the World Water Council) gave a presentation on "Scientific knowledge & technology, ethics and water resources". He exposed Brazilian national issues in the field of water and the way in which they are dealt with. He listed a number of ethical principles to be respected. Water is life. No one can survive without it. He clarified the central role of water in

the two fundamental processes of photosynthesis and aerobic respiration. Brazil is a large country with much potential but is also faced with many challenges. Challenges of the water sector include power generation, irrigation, environmental protection, scarcity, water supply, flood control, navigation. The management of water resources goes hand in hand with the objectives of development, including human development and poverty reduction. Brazil is a nation of big contrasts, ranging from high technological potential to deep needs. As for the laws dealing with water resources management, it should be recalled that with the revision of the Federal Constitution in 1988, all water is now either federal or belongs to the State. There is no private water in the nation. Some fundamental principles of water resource management, considered also by other confining countries, are present either in the federal or in the State water policies. According to them, water is a public property, a limited natural resource, which has economic value; when there is a shortage of resources, priority in the use of water resource is to be given to human consumption and the watering of animals; the management of water resources should always allow for multiple uses of water; the river basin is the territorial unit for the implementation of the national water resources policy. It is obvious that in the water resources management, the ethical principles are to be backed up by technological knowledge. Priority is therefore to be given to research and development. As for perceptions, there is a need to improve information and training. Overcoming inequity is a must. Habits of waste have to be changed. A new managerial role is also compulsory: it is not enough to educate scientists. Society as a whole is to be educated. Care is the overarching ethical principle. We need to take care of water. This has indeed not been done for a long time. There is also a need to increase the sense of responsibility. Shared responsibility, not only at the national level, but also for surrounding countries. Sharing of benefits is another important point. Science and technology is to be considered as a tool to overcome inequity. Co-operation is a must, as it is indeed what allows man and the human family to grow and distinguishes us from animals.

According to Mr **Pierre Weill**, Chancellor of UNIPAZ, a great deal has been said recently on ethics in correlation with science and technology and citizenship. The main issue is how to get people to accept these principles and to fight for them. One thing is of course to state the principles; another is for the principles to be introjected in the population. Establishing an ethics Chair at each university and disseminating ethical principles is indeed a good start. Of course this does not mean that these principles will also be applied and used in everyday life. It is trivial to point out that the Ten Commandments have been in existence for millennia and that they are widely known; but we still live in a world where people kill each other, although they know the Commandments quite well. And this tendency does not seem to decrease. So stating a principle is obviously not enough to ensure their acceptance and introjections. This is a matter of education. Teaching ethics is one thing and education of ethics is another thing. This is what should be retained. One year ago, having become Director of the Peace University in Brasília, modelled after the United Nations Peace University in Costa Rica, Mr Weill faced a challenge: what to do to help other universities in this field? An idea was to prepare a synthesis. The Venice Declaration of 1986 states that science and technology cannot be considered in isolation from its various applications. Facing the challenge is an interdisciplinary matter. There is a need to consider at the same time science, philosophy and cultural heritage. The importance of opposing elements (eg, right and left brain; reason and intuition; thought and heart; east and west; male and female) should not be overlooked as it gives a way to read the genesis of the suicidal tendency of the human race. A process of causality where cause and effect go back 4000 years. This brings us back to a Newtonian and Cartesian paradigm in which the male side has overcome the female one over thousands of years. Each one of us is male and female. Children have to be educated about

this split and not to inhibit the female side, not to let effectiveness overcome affectiveness. All the work carried out to organize the education of peace and ethics brings us to a fundamental theory: the wheel of destruction. A wheel split into three parts: Individual, Society and Nature. The process of destruction starts in the mind of the individual, a delusion of separation, between subject and others, the world etc. This separation brings pain. The individual will contribute to disorder through the absorption of destructive values. At the political level this brings competition instead of cooperation. Eventually this would entail the destruction of nature at all levels. The answer is to turn the cycle of destruction into a cycle of peace, turning negative values into positive ones. This could be achieved with a holistic approach, through meditation, which would turn all the negative parts into positive through love and joy. Being a solid foundation for the positive ethical values to be introjected into the population. Also in the case of health, there is a need for internal and external balance. At the socio-political level we need to develop cooperation through mutual gains, while at the economic level the idea of solidarity. Of course the change depends on political decisions. And here the challenge is left to Governments and International Organizations.

Session on the Ethics of Outer Space

Mr. **Marcio Barbosa**, UNESCO Deputy Director-General, introduced the speakers and the debate. Mr Alain Pompidou is honorary member of the European Parliament, Member of the National Academy of Technology of France, Member of the French National Commission to UNESCO, and Rapporteur of the COMEST sub-commission on the ethics of outer space. Ambassador Campelo represented the Brazilian Space Agency.

Mr **Alain Pompidou** first expressed his satisfaction that the COMEST session was held in Rio. He emphasized that Brazil is now a space power. He recalled that 350 years have passed between the forced retraction of Galileo before the Inquisition, and the Galileo Satellite Project.

The unprecedented impact of scientific and technological progress, he stated, grounded the need for ethics in societies. He defined ethics more precisely: it is at one and the same time the moral standard for action and a reflection on risk, therefore ethical reflection requires an exchange of ideas and experience conducted in total freedom and independence between specialists of various disciplines, policy decision makers and those who act on behalf of civil society in all its diversity. Public debate, he added, is a vital feature for democracy.

After briefly recalling COMEST's mission and its cooperation with the European Space Agency (ESA) and the United Nations Committee on the Peaceful Uses of Outer Space (UN-COPUOS), he highlighted the specificity of ethics of space policy. Space technologies are at the same time promising and disturbing. They mobilize substantial volumes of capital, they represent a power game between nations, and they hence necessitate an ethical approach, addressing their acceptability by the public, the equity of access to them, the protection of the integrity and dignity of man, and an understanding of space as the heritage of mankind as a whole. In this context, interaction between science and technology, ethics, politics and society provide an opportunity to define technological options for space policy, which will shape the future of our societies.

He then explained the recommendation of the sub-commission of COMEST on the ethics of outer space, grouped in four categories. In the first category, space is considered as an ethical issue. Under this aspect, the first recommendation states that ethical principles must come before law and not the reverse. They must precede and guide the definition of space policy, and they must be applied at every stage of the development of space technologies. Hence, contrary opinions must be taken into account, difficulties must not be concealed, and risk reduction procedures must be clearly defined. The second recommendation, with regard to orbital stations, states that biological production activities necessitate adjusted precautionary measures, and that manned flights will make available a new territory for humankind. The third recommendation, also regarding orbital stations, declares that astronauts must serve and benefit the same rules as applied on Earth.

A second aspect of space is to see it as a dimension. On this question, it must be claimed that the ultimate purpose of all exploration of space is to broaden human experience and knowledge, being aware that it has become possible to study earth from space with unprecedented precision. The first recommendation is the proclamation of three principles in the exploration of space, namely the non-appropriation of space, the freedom to access

it, and the seeking of benefits for all humankind. The second recommendation is that the effort to reduce the production of space debris must be accepted by all concerned bodies, while unilateral measures would create distortion of competition between established and emerging space powers. Equitable competition in that respect necessitates rules embodied in international law.

Space can also be considered as a tool, especially with regard to the risk assessment, the controversial use of nuclear energy, electronic surveillance, planetary encroachment upon individual freedom, acceptability of messages transmitted through satellites, and the balance between collective and individual protection. The general principle here is that respect for the individual stops when it becomes a threat to the collectivity. A worldwide "co-regulation" system must then be defined in international consultations. Hence, the first recommendation on that matter is to consider space as a technological motor for mutual and reciprocal benefit, as an early warning system to protect the environment, and also as a safeguard system for data acquisition and protection. The second recommendation is to distinguish between three kinds of data. Scientific data are subject of shared knowledge; environmental data necessitates the implementation of a sharing of technology, while commercial data relates to the use of high technology space products. A third recommendation regards electronic surveillance, and advises that the confidentiality of exchanges be protected while avoiding the dissemination of subversive messages or unlawful actions, hence leading to the necessity of a legislation on the definition and use of satellite data. A fourth recommendation aims at the protection of public freedom and cultural identity. It recommends guaranteeing the integrity of cultural identities, to allow minorities to express themselves, to avoid standardization of culture and to allow the emergence of new identities arising out of electronic forums. Fifthly, the working group advocates for a co-regulation at the worldwide level.

Space can also be viewed as a perception, by referring to the image of outer space in public opinion. The ethical demand here is to escape from the emotional context while preserving critical views. Appropriate communication is founded on accuracy of training and information without seeking to play on the credibility of individuals or populations. An active and interactive training based on mediation pedagogy is required. The first recommendation stresses the need for a broad public dialogue, prepared by university courses and a network of schools of journalists. The role of UNESCO and space agencies here would consist of ensuring proper electronic forums and delivering an adequate message on space ethics. The second recommendation advises that the basis of a culture of space be improved through a mediation pedagogy process.

On the basis of this group of recommendations, Mr Pompidou affirms that the ethics of space need a shared commitment, which supports a new strategic approach for space decision-making and for the benefit of mankind. Such a commitment has four parts. Firstly, the crisis of nation states, which are no longer sole guarantors of moral integrity, is liable to result in a situation of abuse of dominant position. Secondly, international dialogue on ethics of space must ensure equitable allocation of resources, the sharing of knowledge and data produced by technology according to the above distinction between three kinds of data, and the equitable distribution of frequencies and orbital positions. Thirdly, there is a risk of contradiction between the principle of non-appropriation of space, as notably affirmed by the 1967 space treaty, and the principle of freedom for exploration and any use of outer space. Fourthly, it must be clearly stated that space must remain at the service of all mankind, and that, though man may appropriate the space technology that he has elaborated and is responsible for, he has no right whatsoever to appropriate space itself. A shared international approach should admit that space cannot, as a

whole, be considered as an extension of planet earth, and that the notion of expansion of human activities justifies the fact that outer space should be considered as a scientific field for humanity.

Mr Pompidou's conclusion was split in four parts. The first conclusion is that the emergence of an ethics of space policy is a new challenge for nations and humankind, and that it is grounded in three major principles, namely the respect for dignity and socio-cultural identities, the respect for freedom of choice and the critical spirit, the respect for the principles of equity and solidarity. The second conclusion is that the evolutions of space policy to the benefit of mankind necessitates to address the definition of a broadly accepted *code of ethics*, the respect for principles laid down by United Nations, and the creation of a *management system* of space data for critical aspects, namely global warming and climatic change. The third conclusion is that the sharing of benefits resulting from space technologies should be promoted, according a greater importance to both the needs of developing countries and the rights of countries subjected to monitoring, while at the same time safeguarding the respect of sovereignty of nations states which acquire, supply and make use of space data. The last conclusion advocates the need for an ethics of space policy, or "space ethics", that represents at the worldwide society level a new strategic approach for space decision making at the benefit of mankind.

Representing the President of the Brazilian Space Agency, and expressing his regret at not being able to attend the session, H. E. **Amb. Campello** thanked Mr Barbosa before commenting on the report on the Ethics of Space Policy presented by Mr Pompidou. He said he wanted to focus on a few specific subjects, of particular relevance to the Brazilian situation, and recalled the five international agreements drafted by COPUOS and signed by many countries. As said, the discoveries come at a faster and faster pace, affecting the destiny of humanity as a whole. Space progress is more astonishing than ever, and some technologies have become essential to our lives, like the Global Positioning System (GPS). But what is the price of the quest for space? Risks and challenges are many. The debate is still ongoing about the legitimacy of expenditure in this domain, in developed and developing countries alike. He also recalls the vocation of Brazil for space, which makes the country a privileged player in the field. Again, it is very timely and appropriate that the Third Session of COMEST is held in a developing country. Hence, this message from Brazil, a country very determined to overcome obstacles to respond to challenges in this area. The certitude is expressed that COMEST will understand our message and our concerns. There is a need for international co-operation, not driven only by trade, but by equity, solidarity and exchange of technological experiences. This is no longer an option, but a necessity, because of the high costs and the high level of sophistication involved. The International Space Station is a good example of this, involving nowadays USA, as well as many European countries and Canada. This co-operation must also extend to developing countries, for the benefit of all countries. The global dimension of space activities is to be borne in mind. Brazil embraces the idea that ethics precedes law. But law must not stand still. He concludes by recalling the endorsement of the UN Resolution on international co-operation on peaceful use of outer space, taking into careful consideration the needs of the developing countries.

Discussion

To open the discussion, Mr M. Barbosa stressed that reflection in ethics requires exchange, as Mr A. Pompidou had stated. COMEST, he said should have a voice, and does not yet engage COPUOS. Yet, a new exchange has started that was obvious in Bremen. The President of the Free University of Brasília said he was delighted and felt at home, notably with the concept of humanity being legalized. It would be ideal, he stated, if it was acknowledged that space belongs

to humanity. The delegate of the International Labor Organization (ILO) wondered about the implementation of possible international instruments. An organization aiming at promoting the implementation of declarations, he stated, can use either a repressive ethics, like the World Trade Organization (WTO), or incentive ethics, like the ILO. He asked what way should be favoured regarding possible international instruments in the field of outer space. Mr A. Pompidou replied that the question was premature. He then mentioned two technical authorities that manage satellite orbits and frequencies, as well as the World Meteorological Organization, that filters and disseminates data. A regulation system for data, he said, is needed. Mr M. Barbosa closed the discussion by emphasizing the openness of COMEST and his hopes for the future debate.

Session on a Code of Conduct for Scientists

This session was chaired by Mr **J. E. Fenstad**, Chairperson of COMEST, who recalls in the introductory remarks that more than 170 codes of conduct covering 6 continents are currently in existence. They have different scopes. Some are broad and some specific, dealing with specific professions and domains. This was a main concern of the World Conference on Science, where the idea of an oath or pledge has been always perceived as controversial. However, this is not a good reason to avoid debate on it; rather the opposite. In this regard, it should be mentioned that in 2002, one of the outcomes of a UN interagency meeting was to request COMEST to look after this matter.

Mr **Henk ten Have**, Executive Secretary of COMEST and Director of the Division of Ethics of Science and Technology, gave a presentation entitled "*Towards a universal ethical oath for scientists*", starting with a brief history of the idea of an oath, mentioning a number of milestones, e.g., the Hippocratic oath (ca. 470 b.c), the oath and prayer of Maimonides (end of XII c.), Leonardo da Vinci (end of XV c.), and then, during the 20th Century, the Canadian "Ritual" for Engineers (1926), the Declaration of Geneva (1948), and the Russell-Einstein Manifesto (1955). He recalled that the United Nations tackled the issue starting in the 1970s with Resolution 2658 (XXV) on the "Role of modern science and technology in the development of nations and the need to strengthen economic, technical and scientific co-operation among States". In 1974, at its 18th session UNESCO's General Conference adopted the "Recommendation on the Status of Scientific Researchers" calling for: scientific researchers' highly responsible attitude; encouragement of spirit of community service; development of educational techniques for awakening and stimulating personal ethical qualities and habits of mind; reinforcement of scientific researchers' sense of vocation; and definition of scientific researcher's ethical responsibilities and rights. A widespread interest of the international community began that year through a number of initiatives, such as the 1974 Mount Carmel Declaration on Technology and Moral Responsibility; the 1984 Uppsala Code for Scientists; the 1987 M.I.T. Biologists Pledge; the 1987 Hippocratic Oath for Scientists of the Nuclear Age Peace Foundation; the 1988 Buenos Aires Oath; the 1991 Toronto Resolution; the 1991 Scientists Pledge not to take part in military-directed research (SANA, London), etc. During the 1999 UNESCO/ICSU World Conference on Science, special attention was devoted to the issue of ethical principles and responsibilities in the practice of science. Joseph Rotblat in his keynote address called for an ethical code of conduct for scientists formulated as a Hippocratic oath. The WCS International Forum of Young Scientists strongly supported the establishment of a scientific Hippocratic oath. In this regard, the final document "*Science Agenda – A framework for action*" states that ethics and responsibility in science should be an integral part of the education and training of all scientists; young scientists should be appropriately encouraged to respect and adhere to the basic ethical principles and responsibilities of science; COMEST and ICSU have a special responsibility to follow up on this issue. On 11 Sept. 2001, the terrorist attack against USA added a specific anti-terrorist concern to the scientific ethics agenda. In October 2001, the UN Secretary-General established a "*Policy Working Group on the United Nations and Terrorism*" to identify longer-term implications and broad policy dimensions of terrorism for the United Nations. In 2002, the

Working Group issued a Report with 31 Recommendations towards a universal ethical oath for scientists. Recommendation 21 stated that "Relevant UN offices should be tasked with producing proposals to reinforce ethical norms, and that the creation of codes of conduct for scientists, through international and national scientific societies and institutions that teach sciences or engineering skills related to weapons technologies, should be encouraged. Such codes of conduct would aim to prevent the involvement of defense scientists or technical experts in terrorist activities and restrict public access to knowledge and expertise on the development, production, stockpiling and use of weapons of mass destruction or related technologies." The UN General Assembly and Security Council endorsed the Report and its Recommendations, transmitting it to all the Organizations and Specialized Agencies of the United Nations System. In February 2003, a UN Inter-Agency Consultative Meeting was held at UNESCO HQs in Paris, to discuss Recommendation 10 (focused on education, tolerance and respect for human dignity) and Recommendation 21 of the Report. At the end of this Inter-Agency meeting a number of General Recommendations were issued: that ethical codes of conduct for scientists and engineers are to be encouraged; that ethics of science education and awareness are to be promoted; that COMEST could play a decisive role in fostering dialogue on education and ethics of science; and that COMEST together with ICSU should be involved in the field of the responsibility of scientists. The ethical task given by the World Conference on Science to COMEST and ICSU is recalled and reinforced. For its part, ICSU has already begun extensive research in the domain, issuing in 2001 a document on "Standards for Ethics and Responsibility in Science". ICSU research takes into account 115 ethical standards for science (39 international and 76 national) and shows an exponential increase of the number of standards over the years (6 before 1970; more than 40 during the last 5 years). The material is classified into 15 categories (oath, pledge, code, guidelines, declaration, principles, appeal, recommendation, manifesto, statement, declaration, resolution, convention, charter, law, others) and five cluster groups (pledge, guidelines, statement, law, others). It should be mentioned that, out of 115 ethical standards, only 6 are oaths and pledges, as an oath is perceived to be of a more binding nature than mere guidelines. From the analysis, a number of core traits or virtues related to individual behavior can be listed: honesty, openness, fairness, truthfulness, accuracy, conscientiousness, respect, collaboration, and loyalty. The same is valid for a number of core traits or virtues related to the scientific community: social responsibility, environmental responsibility, sustainable development, socio-economic development, social welfare, socio-economic equity, gender equality, scientific freedom, peace, democratic development, human rights. In the end, an analysis was given of the steps that would characterize the work of COMEST in this domain, aiming at delivering to the General Conference of UNESCO a Declaration including an oath or pledge by Fall 2007.

According to Mr **Roque Monteleone Neto**, University of São Paulo, this is indeed a complex topic, and the time allocated to it is always too short. His focus is on the area of biology. Lately, this area has developed tremendously. Attention has been attracted in international fora by its implications on the human being and humanity. In the year 2000, when the attempt to reach an agreement on biological weapons failed, attention reached its highest peak. In the media, biotechnology and biological weapons are the hottest issues. In biotechnology new drugs are opening up new perspectives and have a direct connection with the promotion of development. Also biological weapons have lately had wide coverage associated with the prevention of bio-terrorism. The government and the media also devoted special attention to anthrax-contaminated mail. In addition, suspicion of bio-weapons has remained high due to the attack of Iraq and threats of reprisal. These weapons have been banned by the Geneva Protocol, ratified by 32

countries. It is important to mention that this Protocol is a code of conduct containing an ethical principle to ban bio-weapons in manned conflicts. The Geneva Convention covers a wider area, giving the possibility to extend the application of this ban. In the end, 146 countries did ratify the Convention but with neither mechanisms for application nor a verification system. In this framework as well, a code of conduct was requested. In the end, the final version of the verification protocol was rejected due to a veto by the US. Signing a convention without ratification does not allow it to be applied, as has been the case for Iraq. To face this situation, there is a need to establish limits regarding risks, and also to strengthen the application of the convention on the ban on bio-weapons. While a code of conduct may be appropriate for the first issue but not with the second one which is political in nature. In the first case, banning may not be desirable because it stops research. But in the second there is a need for a very clear ban to protect humanity. Also, if codes of conducts are established, they should be translated into and represent different cultures. Under these circumstances, a universal code seems difficult to achieve while a convention, which has been signed by almost 150 countries, could be considered as universal... Pharmaceutical industries should set up their own control. As a matter of fact, there are some 100 molecules, which are risky and stored in labs, thus open to reproduction. Under these circumstances, it seems difficult to have a reliable code of conduct for such a situation. In any case, two US scientists proposed a code of conduct for activities handling hazardous pathogens. In this regard, the issues of extradition and extraterritorial jurisdiction also come into the picture as the acceptance of these two concepts determines the effectiveness of a code of conduct. This is an issue that should certainly be addressed by the UN. Clearly, this does not only concern bio-scientists. For instance, and despite the non-proliferation treaty, physicists are pursuing experiments and disseminating technical know-how about the atomic bomb.

Mr **Simon Schwartzman**, Brazilian Academy of Sciences (Berkley, California), pointed out that it is possible to talk about codes of ethics or conduct from a purely normative point of view, trying to establish appropriate and inappropriate behaviour; or from a sociological point of view, asking why such codes emerge, and the roles they have. As a social scientist, he prefers the second approach. Codes of ethics are considered something necessary and important. At the same time, there is no clear consensus on what a code should be like. It is essential that codes of ethics be controlled by the professional community they address, rather than by external authorities. This autonomy is based on trust, which can only be maintained if there is an agreement that the professionals are working for the common good. Codes of ethics are adopted because there is a need for common standards, minimizing interpersonal conflicts, and a framework in the name of service to others. Traditionally scientists have argued that they are guided by the advancement of knowledge and the advancement of mankind. Since modern times, these two values have been assumed to be in harmony. Two strains of thought have followed. One, that science should remain independent and self-regulated, avoiding the temptations of politics or markets. The other is that scientists should get involved in politics and economics in order to make rationality prevail. These two visions share the notion that scientists are defined by their commitment to searching for truth through the use of rationality. This vision was challenged by two developments. the end of the belief in the inherent goodness of the advancement of knowledge and technology; and the breakdown of the dividing lines between science, government, industry, business, and education. It is difficult to argue that there is still a unified scientific profession with a common set of values. This is perhaps an explanation for the intensive efforts made to develop codes of conduct, and the lack of clarity on what these codes should contain. Scientists feel the need as they are losing autonomy and intellectual independence. Society feels the need because it does not trust the

scientists anymore. New codes of conduct should be the outcome of difficult negotiations between scientists and society, to recover the old relationship of trust. They cannot be written by the scientists alone, and cannot be imposed on them from outside. The codes of conduct should not be applied only to scientists, but to any institution dealing with knowledge and their applications. And they should only be enforced, through well defined legislation and oversight bodies.

Discussion

An observer pointed out that science does not work in a vacuum. It needs financial inputs. Politics and business have also to be considered. If we demand ethics for science, we have the right to demand ethics for politicians and business. Otherwise one is to remain skeptical about codes of conduct. It is a reality that an important share of scientists work on military programmes. This is an issue to be addressed and alternatives should be found.

Another observer raised a voice of hope. Let us not think of scientists as evil people. The great majority are indeed people with a deep sense of responsibility. It would actually be desirable that people in other professions show as often their own sense of responsibility. There is a basic commitment that accompanies the choice to be a scientist that allows for core shared values. Let us try to identify the cohesion before focusing on the peculiar differences.

Another observer pointed out that from a psychological viewpoint one could go from this complex situation back to basics. An individual engaged in destruction is either a psychopath or a criminal, not a scientist. At the University of Peace there is a new concept, 'normosis', a behavior adopted by the majority on the basis of consensus. This concept would define truly pathogenic behaviors, which are considered to be socially normal. This concept could prevent scientists from being considered psychopaths or criminals.

Another observer, a scientific journalist, asks whether it is possible to foresee that scientist tell the truth to the public? Many core issues are hidden from public view. Is the uncertainty involving new technology to be shared with the public at large?

Another observer expressed concern about the way ethics is used. Dealing with water we need more than ethics.

Mr Fenstad, closing the session, recalled that communicating scientific uncertainty through the media is difficult. The public understanding of science is a complex affair. He also informs that COMEST has started an expert group on the precautionary principle precisely to address how to communicate about risks. He concludes by recalling that ethics implies arguing about conflicting values.

Session on Ethics and Nanotechnology

Mr **J. E. Fenstad**, Chairperson of COMEST, introduced the debate and the speakers. He first recalled that the mandate of COMEST included a watchdog role, in order to detect the early signs of risk. It is therefore logical that the Commission addresses the issue of nanotechnology, and asks if the topic deserves deeper examination. Mr Bert Gordijn, from the University of Nijmegen, the Netherlands, is a philosopher and ethicist. Mr Fernando Galembeck is Head of the Institute of Chemistry of the University of Campinas, Brazil. Mr Roberto Carlos Salvarezza is Head of the Scanning Probe Microscope Laboratory at the Applied and Theoretical Physical Chemistry Research Institute of Brazil.

Mr **Bert Gordijn** gave a presentation entitled "From Utopian dreams and apocalyptic nightmares toward more balanced views". The subject, he said, is tricky, and the field, emerging. The presentation was divided into three parts. After an introduction on the background of nanotechnology itself, Mr Gordijn presented some utopian dreams and apocalyptic nightmares it provoked, and finally proposed a six-step method aiming at the construction of more balanced views. R. Feynman, in 1959, stated: 'The principles of physics do not speak against the possibility of maneuvering things atom by atom". In the 1980's, the progress in microscopy and in theoretical work made this view more realistic. Government spending worldwide on nanotechnology grew from $1 billion in 2001 to $2.5 billion in 2002; in the United States, venture capital investment on nanotechnology was of $100 million in 1999, $780 million in 2001 and $1.2 billion in 2003. Furthermore, there are great expectations of nanotechnology: it would be the key technology of the 21st Century, lead to cheaper, faster and cleaner manufacturing, allow the production of better products, and apply to many different fields and products. These expectations can go as far as utopian dreams: clean manufacturing, reversal of environmental degradation, inexpensive high quality products, unprecedented objects and materials, mass produced food, drastic improvement of medicine, and finally the achievement of social well-being and peace. On the other hand, some find this issue cause for apocalyptic nightmares. They see nanotechnology as a source of environmental damage, disruption of economies, unstable arms race and totalitarian surveillance; they also build scenarios on the hypothesis that man would lose control of the assemblers he constructs. The present state of the debate is thus a radical opposition of views, characterized by one-sided and narrow perspectives, which lead to undesirable situations that hold the risk of conflicts and unwanted backlashes.

To build a more balanced view, Mr Gordijn proposed a six-step method, aiming at a rational assessment of the ethical desirability of developing research in a specific field within nanotechnology. The first step consists of determining what specific field is to be assessed, for there are different projects with different technical aspects such as memory enhancing nano-neuro implants, filters with nano-pores for the recycling water or nano-devices for surveillance purposes. To date, the specific fields of nano-research are: materials and manufacturing, nano-electronics and computer technology, medicine and health, aeronautics and space exploration, environment and energy, biotechnology and agriculture. The second step is then to formulate the objectives of the field of research, and the third is to question the ethical desirability of the determined objectives. Assuming a positive answer, the fourth step is then to ask if there is a contribution of nano-

research to the achievement of the objectives, and the fifth would then be to identify the ethical problems. In the current debate, the latter would usually concern risks, equity, privacy, and the approach to nature. In the sixth and last step, the question is asked: can the ethical problems be overcome? In some cases, it may be too late, for instance. Mr Gordijn here mentioned the example of risk management in the Foresight Guidelines on Molecular Nanotechnology. With this method, he claimed, we can now rationally assess the ethical need to develop any specific field.

In conclusion, Mr Gordijn said that the current debate is unsatisfactory. There is therefore a need for more balanced views, which his six-step method addresses, contributing to rational and systematic assessment of the debate. Interdisciplinary research groups are needed, he added, as well as adequate funding. Indeed, research and development funding in nanotechnology is very unevenly distributed and growing.

As a chemist, Mr **Fernando Galembeck** recalled Paracelsus, who said that there is no good or bad molecule. But the debate, he added, is hot. There are 40,600 Google entries for "nanotechnology", and there is a growing number of books and institutes interested in the subject. The issue of privacy is more and more relevant. The threats here could come from microcomputer sciences or GPS, or from the advances of neurosciences. However, individual control and manipulation, he said, is now being done very efficiently using the technologies of social engineering. Concern about intellectual property is another hot topic in the debate. Many Brazilian scientists do not read or write patents. This leads to an unethical transfer of wealth from poorer to richer countries. This also leads to a significant waste of scientific effort, with significant overlapping of research. Hence, Mr Galembeck stressed that Brazilian scientists should take patents more seriously.

On the issue of the Environment, he declared that in depth analysis of the life cycle of products is needed. For example, we should wonder about the fate of arsenic present in semiconductors, of cadmium in batteries, paints or nanomaterials. Mr Galembeck mentioned the recycling of salted water in northeastern Brazil, where water is used to raise shrimps, raise fishes, and then irrigate a salt tolerant plant called Atriplex. This story, he said, is a good one, one that fights poverty. Regarding employment, Mr Galembeck recalled that new technology both creates and destroys jobs. Nanotechnology is expected to create 2 million direct jobs worldwide within a decade, but there is no estimation as to how many jobs will be terminated. Mr Galembeck suspected the number could exceed 2 million and that the jobs would most probably be created in rich countries and destroyed in the agricultural sector and in poor countries. Nanotechnology is welcome in all areas of the economy that have reached global competitiveness, where local production is favored, or where the input of nanotechnology could address local needs that do not receive attention from worldwide technology suppliers.

Mr Galembeck added a word on the readiness of Brazil to face nanotechnology in the field of education, and the need for action on that matter, before concluding that most of the problems raised by nanotechnology are not new and have been recurrent over decades as a result of new technologies, new materials, mass destruction, etc. As any technology, nanotechnology will be the friend of those who know it and a foe to the ignorant.

Mr **Roberto Salvarezza** gave a lecture addressing the question "Why is nanotechnology important for developing countries?" He started by expressing his astonishment that, thanks to new computer and microscope technology, it is now possible to follow chemical reactions in real time and that humankind is able to synthesize molecules. However, nanotechnology, he added, is also liable to produce a significant impact on the society. It is obvious, he stated, that nanotechnology will affect industries like electronics and healthcare, and he mentioned

carbon nanotubes, silicon nanocrystals, nanostructured catalysts, etc. There are, however, different types of concerns. If we focus on equality, nanotechnology, Mr Salvarezza claimed, is an excellent opportunity to try to reduce the technological gap. Indeed, the development of nanotechnology in developing countries may be ecologically feasible and affordable. Hence, nanotechnology is a very attractive field for Third World research, requiring only modest resources and low funding. This is, overall, a unique opportunity for countries with a high scientific level and low economic development. However, the funding is still excessively low in these countries for nano-research, and a societal debate is therefore needed, including states and the business community. Also, in most of these countries, the critical mass has not been reached yet, that would allow significant development of nanotechnology. Furthermore, there is a need to identify specific opportunities that would be locally appropriate. Here again, the link between the scientific sector, governments and the business community needs to be reinforced. Mr Salvarezza concluded by affirming that nanotechnology is an opportunity, for Third World countries, but that there is an urgent need for investment in both research and education. Otherwise, he warned, dependency would increase, and so would poverty.

Mr **Juan Carlos Tealdi** started by reflecting upon which human values were challenged by nanotechnology, and stated that the most obvious issues concerned DNA and biotechnology in general. Such changes, he added, could hardly be stopped. The question of human control on DNA is especially worrying, particularly as decisions of wide concern are presently being taken by a few isolated specialists. Therefore, he claimed, the challenge is to set targets for nanotechnology that make sense in the life of human beings. We may be in the process of modifying the very equilibrium of life on our planet. Mr Tealdi mentioned the project of decoding the human genome and the difficulties it raised, emphasizing the relationships between the different parts of the human organism. Some very problematic issues were raised, he said. Some ecological groups want the research on nanoparticles to be frozen. The failed experience of gene therapy, Mr Tealdi warned, should indeed be remembered. The Parliamentary Office of Science and Technology of the United Kingdom, for instance, commissioned studies on the value of human identity. The progresses of memory may be a consequence of nanotechnologies, evocating characters from the literature, with more than human abilities. If a supercomputer can beat Kasparov, Mr Tealdi asked, what will happen when it uses biological material? There will also be ethical issues regarding virtual reality. Yet another ethical issue regards patents. At Stanford University, a molecule able to capture oil molecules was discovered. Every one can see the economic implications of such a patent, as well as the possible social utility of such a discovery. Our knowledge of this field is now sufficient, Mr Tealdi stated, to raise ethical issues in advance. We now know that human health and justice for every community in the world will be the two main ethical challenges for nanotechnology. He wondered whether these new technologies should be spread throughout the world when hunger remains a problem. Advantages should be analysed and efficiency aimed at. Regarding the issue of justice, one can consider three simultaneous dimensions, namely respect, what each one does, and freedom regarding the duty of humankind. Moral behavior, Mr Tealdi concluded, begins with the respect for the human being.

Discussion

The discussion started with the expression of regret that social scientists do not contribute to the debate on nanotechnology. While scientists discard the contribution of social science, it was asked, how long can we avoid the misunderstanding between the public and science, and will nanotechnology replace GMO in this

regard? Mr J. E. Fenstad said that social scientists will indeed be included in the ethical research of COMEST and UNESCO on nanotechnology. Another intervention stated that several schools of philosophy already have significant exchange with experimental sciences. In some academic fields, it was added, ethics are not fundamental anymore. To a question on figures regarding investment in nanotechnologies, Mr J. C. Tealdi answered that the figures depend considerably on the source. The only sure thing, he added, seemed to be that though we increasingly manipulate matter at the smallest level, all technology will be changed, no assessment of this impact has been made. Mr R. Salvarezza stated that risk assessment has already begun, but only slowly. Environmental impact, he added, must be a concern for each project.

Round Table I: Ethical implications of research with human beings in developing countries

Mr **Henk ten Have**, Director of the Division of Ethics of Science and Technology and Executive Secretary of COMEST, introduced the debate and the speakers. Mr Miguel Kottow is an ophthalmologist and Professor at the University of Chile, member of the Advisory Committee of the Latin American Network for Bioethics of UNESCO and of the Latin American Council for Bioethics. Mr. Cesar Jacoby belongs to the Department of Science and Technology of the Ministry of Health of Brazil. After thanking the audience and the speakers for their involvement, Mr ten Have stressed the importance of research ethics in science ethics in general. The issue, he added, emerged just after World War II. One might have thought that the question was over, but new issues have been raised in the last ten years.

Mr **Miguel Kottow** started his presentation "Some ethical implications of research on human beings in developing countries" by rejecting the term "developing countries". The truth, he said, is that most of these countries are un-developed, and have few chances to develop economically and to become rich countries. Then he also rejected the expression "research on human beings", preferring "research with human beings". In the first case, he explained, human beings are only means, like in the expression "research on animals". The second expression reflects the fact that human beings, as I. Kant stated, are to be considered as ends in themselves. The presentation would then address the following issues: placebos, equipoise, the inappropriate distinction between clinical ethics and research ethics, and finally the issue of exploitation.

Referring to the Art. 30 of the Declaration of Helsinki of 2000, he affirmed that basically, rich countries do not want to change it, whereas poor countries do. The proposed change would consist of guaranteeing the best possible treatment to patients not only from the end of medical study, but from the very beginning. The proposed modification would therefore ban the use of placebos in medical studies and indeed, Mr Kottow affirmed, placebos should not be used. Regarding equipoise, there is a distinction to be made between theoretical equipoise, which Fried defined as "an individual ethical check within the physician-patient relationship", and clinical equipoise, which Freedman called "a collective ethical check of research protocols". In any case, equipoise considers whether equivalence of alternative therapies can be favorably disrupted by additional research. Equipoise should be changed only when there is hope of better treatment, he claimed. In sustainable equipoise, where there is indifference between the terms of the alternative, research is non-urgent, even perhaps superfluous. But if equipoise is based on a conflictive disagreement, i.e. untenable equipoise, where at least one of the alternative therapies harm patients, then additional research is mandatory and urgent. On the whole, research is justified only when there is a reasonable hope of a significant change in equipoise. The general principle here is that it is unethical to recruit patients for clinical research if it means reducing their medical care. Hence, clinical ethics cannot be replaced by research ethics, Mr Kottow claimed. In clinical ethics, he recalled, there is a demand for best medical care and a personal and fiduciary doctor/patient relationship, whereas research ethics consists of informed consent, reduction of risks, scientific validity and researcher/subject contiguity. As therapeutic clinical trials always interfere with best medical care, they must receive proper and specific ethical surveillance. Non-therapeutic trials may be compatible with preserving best medical care, but require special

consideration of risk for subjects who are more susceptible due to disease. As stated in the Helsinki declaration, therapeutic and non therapeutic research are to be distinguished but, as Miller and Brody wrote in 2003, "it is a mistake to label research as 'therapeutic' or 'non-therapeutic', as if that made any fundamental ethical difference". Regarding exploitation, it is true that not all injustice is exploitation, but all exploitation is indeed unjust. Similarly, while not all unethical conduct is exploitative, all exploitation is unethical. Therefore, there is a need to question research protocols in which there is no concern about the benefits for the subject. Subjects must no longer be considered as mostly means and only occasionally ends of clinical trials. This issue is of particular relevance in the Third World, where subjects of clinical research are highly vulnerable: they are susceptible, deprived and dependent. Hence, their inclusion in research that will not benefit them constitutes exploitation. This led Mr Kottow to his conclusion, namely that a double standard in research ethics that would apply pragmatic ethics to host nations and aspirational ethics for sponsor nations is ethically untenable.

Mr **William Saad-Hosne** presented some data on the question of research on human beings, showcasing the Brazilian experience of the National Commission of Ethics in Research of the Brazilian National Health Council (CONEP). Although the question of research on human beings is important everywhere, there are still major differences in the answers given to the questions raised in the field. Regarding the values at stake, there is a possibility of asymmetry between the values of human being as such and as a research subject. Mr. Saad-Hosne first mentioned the guidelines of the World Health Organization (WHO). There are three guidelines, and he claimed that the changes recently made to them are not acceptable, and translate an ethics of convenience. The Helsinki Declaration, he added, is not sufficient - one only needs to look at the facts and the literature to be convinced of it. Hence, each country, he claimed, should rather have its own guidelines on the issue. This is particularly the case of developing countries. Since 1998, Brazil has indeed given itself such a body of guidelines, and notably created CONEP, that federates several bioethics committees. At the beginning, a resolution was drafted by a multidisciplinary, not corporate-oriented, group, and was only targeting the dignity of human beings. CONEP operates this set of guidelines, and represents an unprecedented initiative on that matter. The general principle of these guidelines is that any research involving any risk to humans is considered research on human beings and must therefore be approved by a bioethics committee, itself acknowledged by CONEP. There are four hundred such committees in Brazil and, in order to be acknowledged, such a committee must prove itself truly multidisciplinary. These committees do not only formulate recommendations, but may forbid or allow some activities. The committee that allows research is co-responsible for it, which is, Mr. Saad-Hosne emphasized, a very healthy situation. Another guideline is that patients must be fully and freely informed and that their commitment must be extremely clear and respectful of human dignity. Any commercially aggressive behavior is excluded. The resolutions are legally binding; any person who violates it is liable. It is also always required that the country of origin of the researchers and of the funds is specified. If they are foreigners, they must explain why they are doing research in Brazil, and a preliminary agreement is needed before the research is allowed. The social relevance of the trial is also to be stated. The issue of possible transfer of technologies must be examined, and the results of the research must be disclosed. Furthermore, access to medication must be ensured, and Brazilian researchers must be involved. The Health Surveillance Agency meets at least once a month, and CONEP directly reviews 10% of total research. All information received is stored in a database, which received 1500 new projects in 2002. Therefore, there were probably 15 000 trials going on in Brazil. Around 5% of the projects were rejected. Many also remain pending. There were probably 20 000 individuals involved in medical trials in Brazil in

2002. Finally, CONEP is about to conclude a manual for trial subjects. This by-product, Mr. Saad-Hosne concluded, is very interesting. It is well known by every institution.

Mr **Cesar Jacoby** presented a "Report on the Brazilian Medical Association's position to the proposed revision of paragraph 30 of the World Medical Association's (WMA) Declaration of Helsinki (2003)". He said the Brazilian position was in line with the views of Mr Kottow. He first gave some background elements, recalling that the Declaration, initially adopted in 1964, has been amended five times since, most recently in 2000. In September 2001, a workgroup of the WMA considered paragraph 30 "probably unrealistic in its expectations of researchers and sponsors of research and [that it] should be changed to provide a more balanced view on the requirement of ethical research". In September 2003, another WMA workgroup proposed a revision, and received many comments and suggestions on it. The Report of this workgroup suggested four options, namely: 1) not to change or add any note of clarification to paragraph 30 and to postpone any further discussion of the Helsinki Declaration, 2) not to change paragraph 30 but continue discussion on it, 3) adopt a note of clarification, or 4) to amend paragraph 30. The Brazilian position on this issue is the first option, recalling notably a resolution of the Brazilian Health Council, which clearly states that subjects of research must have access to best proven medical care and that it is unjustifiable to discontinue treatment after the study is over. At the 2003 General Assembly of the WMA in Helsinki, the Council chose the second option, namely to make no changes to paragraph 30 but to continue discussion, based on three options: 1) search for a new consensus; 2) leave the wording of paragraph 30 as it is but specify that the Helsinki Declaration is a declaration of ethical principles and not of laws or regulations, or 3) simply leave the wording as it is. The Brazilian position remains to clearly and unequivocally oppose any amendment. Any change in the Declaration should be done only with compelling reasons to do so. Should a modification be made, it would have to be in the sense of reinforcing the obligation to deliver best proven medical care. Also, Brazil is opposed to the use of notes of clarification, which can only, Mr. Jacoby claims, weaken the ethical requirements. Therefore, and as a conclusion, Mr. Jacoby quoted the proposition of the Brazilian Medical Association on a possible revision of §30.

Discussion

Mr H. ten Have opened the discussion by emphasizing that, from the presentations, one could see that the issue of research on human beings does not only concern developing countries. There is also a lesson to be learnt by developed countries. The background of research has changed, he stated, largely because of strong commercialization. There are common issues, and the experience of developing countries may well be a guide for rich countries.

Another intervention denounced a recent international seminar against double standards to which Brazil was not invited, and the way North American thinking was being imposed in all American universities. Mr M. Kottow fully agreed with this remark. The *status quo*, he added, favors double standards. Mr W. Saad-Hosne stressed that discussion must go on, despite disagreements and tensions, and that an operational and conceptual framework against unethical attempts was needed.

An observer raised the issue of social security and trials. The French law, he stated, forbids all research with a person that does not benefit from the national healthcare system. But how should it be with those countries that do not have such a system?

Another intervention by the President of the Free University of Brasília, criticized the notion of human dignity. It is, he said, not self-evident and needs clarification, given the fact that nobody

treats others as one would oneself. He also claimed that all 400 Brazilian bioethics committees are not as multidisciplinary as CONEP pretends.

Another intervention raised the logical contradictions of the two notions of double standard and developing countries. It also claimed that no one should be afraid of teaching, even coming from Americans, and that one should not underestimate one's own critical mind. Another intervention wondered if there was any kind of penalty for countries or pharmaceutical companies that do not respect declarations. On this last point, Mr M. Kottow stressed the difficulty of transforming declarations into binding international instruments. He also stressed the danger of linking accessibility to care with research. The dignity issue, he stated, starts with the question of who determines dignity. Also, the lack of resources is often a bias when participating the worldwide debate. Mr W. Saad-Hosne stated that, if CONEP has no punishing power, the judicial system does, and CONEP has indeed submitted some files for its consideration.

Round Table II: Development of Science and Technology and sustainability

As an introduction to the Session, Mr **J. P. Kimmins**, Chairperson of the COMEST Sub-Commission on the Ethics of Energy, and Chair of the Round Table, presented some thoughts and ideas on "Implications of science and technology for sustainable development and the environment". He is a forest ecologist, dealing with simple sciences and confronting sciences that are more complex. Work is to be started from the very basic issues. There is always a need to make definitions clear, to be sure that, when one talks, other people understand the same things.

Science is the description, the explanation and the understanding of nature and human systems. Technology is the application of scientific knowledge. In principle, basic sciences *should* be free of values and of ethical implications (either positive or negative). At the same time, the pursuit of the basic social and biophysical sciences *should* be value free.
Technology is just the application of scientific knowledge to satisfy human needs and desires, and in the prevention and solution of problems. The application of scientific knowledge can be either ethical or un-ethical. The judgment on what is ethical or un-ethical is generally sensitive to the time and spatial scales over which the judgment is made. Ethical assessments and standards cannot be made effectively outside of the complexity of the particular system being assessed. In this regard, there is a need to consider the complex implications of the applications of scientific knowledge on the environment.

Sustainability is not a no-change concept, as the natural system we are considering is under constant change, for instance under the action of insects, harvesting, landslide, fire, wind. Additionally the human population is in constant growth. And climate is changing as well. In this situation, people are both the problem and the ultimate solution. Dealing with sustainability implies taking into account its global, regional and local dimension. Urbanization is one of the threats. World Urban Population was 32% in 1955 and is expected to be 60% in 2025. This is changing attitudes towards, and values desired from, the environment. Sustainability has a regional and local dimension. Landscape mosaics are also undergoing a constant shift, joint to non-declining patterns of change in local eco-system conditions and processes. Providing a definition of what is ethically sustainable is therefore difficult as sustainability patterns deal with changes whose time dimension goes beyond the lifespan of humans. The conclusion is that ethics must indeed address complexity. This is well described by the point of view of Aldo Leopold: "The evolution of a land ethics is an intellectual as well as an emotional process. Conservation is paved with good intentions, which prove to be futile, or even dangerous, because they are devoid of critical understanding either of the land, or of economic land-use." As a matter of fact, in carrying out an ethical analysis, one is constantly dealing with an array of methodological principles, spanning from the Einsteinian "As simple as possible, but not simpler", to the pure expression of the Occam's Razor: "As simple as possible, and as complex as necessary". As a parting thought, Mr Kimmins recalled that a problem is an issue that does not get solved. An issue that gets solved quickly is not a problem. Problem-solving requires not only the necessary knowledge, but also a mechanism with which to handle complexity, presenting alternative possible outcomes in a way that produces useful results. Problems often persist because they are complex and the solutions offered are often too simple.

Tackling sustainability, Mr **Sergio Zorrilla**, University of Chile, moves from a discussion on the challenges of rationality and the concept of techno-sciences. Ethics is to be considered as a critical experience. Today we are always thinking ethics under the autonomy of the individual while it cannot actually be assessed as separated from society. Indeed, human beings cannot be considered outside society and without taking into account the dimension of the future. Basic sciences do not seem able to explain the world inasmuch as they are confined and limited to the physical experience. In philosophical and political terms, techno-sciences have produced an important debate also for what concerns the relationships between science and techno-science. In this respect, it can be said that science tries to explain the world in a permanent dynamic of formulation of hypotheses, thus mostly dealing with incertitude. On the other hand, techno-science is transforming the world, constructing products and, in a sense, producing certitude. Sustainable effects have to take into account future generations. They have to be put into the legal framework, as has been happening for bioethics. Sustainability allows talking about politics and the linkages with ethics, as is the case for the precautionary principle. The lack of capital in the developing countries put them in a situation of meager techno-science and then in a situation of dependence. There should be space given to new creativity of techno-science in the developed countries. A lack of coherence can be perceived here. It seems indeed necessary to put in a single speech the requirements and needs of citizens and democracy. This is not fully addressed in the use of transgenic crops, which can destroy capital as they destroy diversity and establish bio-risk condition. In his closing remarks, Mr Zorilla stressed that the notion of sustainability is a part of the phantom of Utopia, allowing theoretical reactions and practical ones.

In his capacity as Chair of the Session, Mr **J.P. Kimmins** makes some remarks, noting that the main problem is not in the basic sciences but rather in the techno-sciences, whose applications do not take into account complex local circumstances, thus producing threat and conditions of instability.

Mr **Luiz Antonio Barreto de Castro**, Chief General of CENARGEN-EMBRAPA, Member of the Brazilian Academy of Science, addressed the issue of "Resource-poor countries who need the advances of biological sciences to mitigate urgent social problems". He has been working to consolidate the scientific component of the agricultural biotechnology sector in Brazil for the last twenty years. He also accounts for thirty years of personal and institutional efforts devoted to genetic engineering in Brazil since its outset. This is intended to give the dimension of the frustration experienced when, due to legal sentences, genetically modified plants cannot be commercially released in Brazil. Why have the social benefits to those who really need GMOs been so modest? What have scientists done to modify this context over these last thirty years? The commercial use of almost all crops produced by biotechnology even when directly intended for human consumption depend unfortunately on never-ending negotiations on intellectual protection rights. The Biosafety European System has taken very long to release the Golden Rice, which is urgently needed, not by the European population, but by the poorest in Africa, in Brazil and elsewhere. The same system released in a much shorter period of time, a cosmetic product: a lethal neurotoxic protein purified from the organism that causes botulism, intended, not for the poor, but to reduce wrinkles of the rich and generate $1 billion dollars in sales in 2003? This is immoral. Wrinkles are not lethal; Vitamin A deficiency that causes blindness is lethal. The fact is that these issues are not scientific, but turned so political that it is unpredictable to see when and how they will be addressed. So, who is right and who is wrong? How can scientists play a role in providing a sound public perception about the gene revolution? How can we correct globally the mistakes we made in Brazil? His clear perception is that science and scientists are on the spot. We

must immediately demonstrate the benefits to the poor of the advances we have made in biological sciences during the last three decades. We have a daring social agenda ahead of us. The only way to alleviate hunger worldwide is by creating jobs and incomes. There is no better way to do that than through agriculture. Brazil hopefully will play a role in the gene revolution; it never did in the green revolution. Hunger is an acute problem worldwide. It is imperative and urgent that a global science-based effort be made towards a less hungry world, focusing on major constraints on agricultural development in fields that can be addressed by the modern biological sciences. It is very difficult to accomplish this task, restricted by never-ending negotiations on intellectual property protection for biotechnology and the biosafety regulations for innocuous products intended for human nutrition. It is unbelievable how distant from reality some sectors of the developed world are when dealing with social problems of the very poor.

Discussion

An observer commented that the impact of new technologies on sustainable development depends on the timescale and the place of their applications. The challenge is to understand the consequences of imported technology in a community, which would indeed entail transformation of the working conditions of the community. This is not a positive outcome without a parallel improvement in working conditions, which is the basis of endogenous development. There is an urgent need for maximum concern for labor structure in the developing countries.

Another observer wondered if, in the same vein, one would not have to be critical *vis-à-vis* the decision of the US not to sign the Kyoto Protocol, as this would be, according to the Bush administration, unsustainable for the US economy.

The previous observer pointed out that his statement was covering developing countries. Labor structure in industrialized countries is different, as there are no cases of one single job covering 60% of the active population. Therefore, the counter question is untenable.

Another observer mentioned that scientists seem not to talk to each other. So the question is, how does one deal with sustainable development without dialogue. Common people feel directionless. Furthermore, the scientists do not have political power. Political implications are important. As for sustainability, science has the greatest role to play. We can make models and projections, and use multiple sources of energy. This would be helpful for all countries, developing and industrialized alike. But what are the consumption patterns in the industrialized countries? All this has to be reviewed and thought about.

One of the panelists made a call to be more optimistic. There is no need for strong opposition and dissent, but rather to drive common aspirations into a more globally helpful action.

An observer recalled that scientific work deals with uncertainty and produces uncertainty. The massive resistance of people to transgenic food is based on ignorance about new technologies. There is a need to clarify these issues to the public. Why is information on scientific uncertainty kept away from the public? What do scientists already know that they do not know about GMOs? What is there yet to know about it? What is there to know about scientific ignorance?

One of the panelists pointed out that the public does not get all the information for the mere reason that scientists do not have access to the media. Also, the generic questions, which from time to time scientists are requested to address, are sometimes very hard to answer because they automatically hide the complexity and uncertainty of the issue itself.

Youth Forum on the Ethics of Science and Technology

Young Scientists, Ethics and New Technologies

Ethics of Sustainable Development

Mr **Pierre Sané**, UNESCO's Assistant Director-General for the Social and Human Sciences, introduced the speakers and the debate. COMEST and UNESCO, he said, were always very interested in Youth. He stressed the importance of future generations in the ethical debate. Bert Gordijn, from the University of Nijmegen the Netherlands, is a philosopher and ethicist. Mr Hermes Arriaga Sierra is the American Regional Director of the International Association of Students in Agriculture and Related Sciences. Mr Rodrigo Vargas, from the International Forestry Students' Association, studies forestry sciences in the Austral University of Chile. Ms Joana Cruz is the Director for Public Health of the International Pharmaceutical Students Federation, and studies pharmaceutical sciences in Portugal. Finally, Ms Mariana Hepp studies medicine at the University of Santiago de Chile.

Mr **Bert Gordijn** made a presentation entitled "Utopian Thought and New Medical Technologies", divided in three parts. He first addressed the general history of Utopian thought, secondly the birth of medical Utopian thought, and thirdly the present state of medical Utopia. Thomas More invented the name Utopia, in "*De optimo rei publicae statu deque nova insula utopia*", published in 1516. It was the name of an island with an ideal society. The word developed into a concept, meaning a piece of writing describing ideals, which do not exist at the location and the time of the author. This concept can be illustrated differently depending on the different periods of human history. In antiquity, Utopia was considered to be the Golden Age, generally considered to be lost. In the Middle Ages and Christian times, there was a new *topos* for Utopia, namely heaven. In the Renaissance, the time of physical exploration of the world and of Thomas More, Utopia was obviously an island. It is only in Modern Times that Utopia came to be considered as being on earth, in the future – a place to be built. There are three dimensions in scientific Utopia: control society, control nature and control man. The latest scientific Utopia is the medical Utopia of Bacon, Descartes, or Condorcet. The content of the medical Utopian ideals is threefold: life without disease and pain, extension of the maximum life span, and improvement of human properties. The present state of medical thought consists of applying the same ideal to specific areas of research, like tissue engineering, bioelectronics, cloning, gene therapy, bio-gerontology and nano-medicine. The argument is always the same: further research should be favored in order to achieve certain objectives. If we are to make any critical assessment of such medical Utopias, we see that we need to find out if the objectives are valuable, what research could contribute to this argument, and then see what ethical problems we may encounter. Mr Gordijn concluded that Utopian enthusiasm is an essential incentive, but not always a good adviser, and that more critical analysis is needed.

Mr **Hermes Arriaga Sierra** gave a lecture on the theme of "Ethical education in order to face agricultural dilemmas". He decided to address three specific ethical problems of agriculture that could be taught in ethics courses for agricultural students. He stressed that the increase of growth rate of populations aggravates the ethical dilemmas in agriculture. The first dilemma is the ecological damage to health due to pesticide. There is, he said, no adequate warning or information on this subject. He raised the

example of Chiapas, where agricultural workers were clearly not informed of the risks, and hence continued using pesticides, believing it harmless. He also took the example of Sonora, where many children were born affected by pesticides, with a deficit in histamine. The second dilemma regarded biodiversity and intellectual property. In Mexico, there are 36 ecoclimates, and 40% of all species in the world. Yet, when a seed company bought some land in 1994, it obtained the patent for a bean that was growing only on these lands, which led to the "trial of a bean". The company that has got the patent has rights on these beans. Another case he mentioned was a typical southern Mexican drink. The patent rejected the indigenous property of the product. Therefore, the benefits of the commercialization of the drink were not shared with Chiapas people. However, the latter were able to point at irregularities in the delivery of the license. Yet teams of the company are still established in the region. The third dilemma concerned genetically modified organisms: should we alter the genetic structure of our environment in the name of utility and profit? There is need, on that matter, for extreme prudence and for further research and better information about research. To face these ethical dilemmas, Mr Arriaga concluded, we must know the difference between right and wrong, and be aware of the problems. There is a necessity to act for common welfare, with social responsibility, especially regarding the conservation of the environment. Therefore, education in ethics is not only needed in universities – it is needed throughout life. A holistic ethics means transformation of the human being.

Mr **Rodrigo Vargas** gave a presentation on "An ethical perspective of forest value". The forest, he argued, may first be seen from several viewpoints, and indeed has been throughout time. When agriculture occurred, the forest ceased to be the place where humans lived or found resources, and began to be seen as a useless ecosystem that had to be eliminated for agricultural purposes. With the development of industry, the forest began to be considered as a source of goods. This vision has been damaging to the woodlands, and has prompted the raising of sustainability as an issue. In Chile for instance, since the late 18th century, the rare woodlands of the north have been used as energy sources for the mining industry, whereas the southern woodlands were destroyed as a consequence of the colonization process. The degradation of woodlands was not restricted to their destruction, but was also due to the application of the "floreo" method, that involves taking only the best trees. Current trends in our societies show greater concern for ecological problems, with progress made in the valuation of the functions and uses of the woodland. There is a difference to make between the concepts of function and use, Mr. Vargas, noted. While the former refers to some intrinsic value, the latter is clearly linked to the notion of economic value. Hence, the values associated with woodland can differ considerably from one group of persons to the next. The function of woodlands, Mr. Vargas elaborated, can be sorted in four kinds. The first one is the regulating function. Forests, indeed, do regulate the water cycle, the micro and macro climate (as thermo regulators and because of their effect on gas concentrations, mainly carbon dioxide), they are essential in sustaining biodiversity, and they also contribute greatly to soil conservation by offering protection from rain, wind, thermo-alterations and human action in general. The second kind of function of a forest is that of support. A forest may be the habitat of indigenous communities, and it can also be valued as a natural source of beauty. Thirdly, woodlands have an informative function, i.e. they have cultural and historic value, as well as educational and scientific interest considering, in particular, possible future discoveries. The fourth kind of function of forest is the productive one. This last function has been generally favored for the valuation of forests in Chile, Mr. Vargas added. The first three functions, he said, are too often neglected. The ethical consideration of forest implies to use all four kinds of functions. Regarding the case of forest development in Chile, Mr. Vargas first stressed the importance of this economical sector. Hence, the exploitation of

the forest has a strong social dimension. Since 1974, the growth has been enormous, possibly excessive. It posed anyway many problems. For instance, there are conflicts in the forest sector – due to the problem of the destruction of native forest as well as to the conflict with Mapuches indigenous communities. The solutions to such problems may be through an initiative such as the Forest Stewardship Council (FSC), that certifies the good handling of the forest from the social, environmental and economic points of view. Law on the recovery of native forests is also an essential step. The challenge for the Chilean forest sector, Mr. Vargas concluded, is to create change in the current valuation of the forest, and to incorporate the idea of sustainable development. This must be accompanied by education in forest sciences, including ethics that is not yet taught in any of the 11 forest faculties of Chile.

Discussion

The debate began with an intervention emphasizing the importance of applied ethics, and the teaching of examples. Another intervention raised the idea of the possibility of creating focal points for ethics in research teams and universities. Mr H. ten Have explained the Latin American School project: a network of teachers, moving throughout Latin America, addressing various theories, ideas and issues of ethics. Another intervention by a student stressed the problems of science education. We are more trained than educated, she said, and there is too much separation between disciplines. One should distinguish between multidisciplinarity that is actually taking place and interdisciplinarity that implies an actual dialogue between disciplines. Another intervention addressed the issue of the means of COMEST for its actions. Another stressed the relationship between social responsibility and common good. Answering the first intervention, it was stressed that mere teaching by example is insufficient. There were also some detailed explanations about the curricula followed by students in various branches, and the actual opportunity to encounter ethical questioning.

Youth Perception of Ethics of Science and Technology

Ms **Joana Cruz** addressed the issue of teaching ethics in Pharmacy. The professional environment of a pharmacist, she claimed, implies being confronted with ethical dilemmas everyday, as the pharmacist is in interaction with ecosystems, clients, physicians, etc. In many pharmaceutical faculties, however, for instance in Portugal, her home country, ethics is not taught. This is indeed a paradox, as pharmacists intervene more and more directly in healthcare. The lifecycle of drugs vary from country to country. In schools, some disciplines are too important, to the detriment of ethics and other important subjects. We sometimes have to question the value of drug use. In this regard, for instance, the pharmacist's choice is crucial. To guarantee that those choices are ethical, a lot of theoretical and practical experience is needed. In particular, future pharmacists need to learn how to listen to the concerns of people, and receive appropriate teaching to that end. The pharmacist should also learn how to deal with his responsibility vis-à-vis the owner of the pharmacy. As far as morphine, or chemotherapy is concerned, what should a pharmacist do if the client refuses to accept such treatment? On these questions, the future pharmacists receive no recommendation or resolution from the academic world. Another ethical issue concerning pharmaceutical students is the destruction of natural pharmacies of the world, mainly the rainforests. Students in pharmacy, Ms. Cruz claimed, should be taught the economics and ecology of production of new drugs, and is concerned with the destruction of the rainforest. The interests of the some 100 pharmaceutical companies doing research in the north of the Amazonian forest differ from the interests of the local population. Yet, the indigenous have the best knowledge of local plants, and what will they know of the wonderful

new medicines issued from these plants? The tropical rain forests are open to predators on every side. The only solution is to give landowners, governments and indigenous peoples a viable economic reason not to destroy the rainforest. It is thus urgent to make pharmacists involved in the development of new drugs. Classes of practice for pharmacy students also need to be implemented, so as to create an understanding of day-to-day ethics. Nowadays, she concluded, pharmacy students are at risk for placing too much emphasis on theory without relevance to cases, values or current concerns, inadequate attention to everyday ethics, and inadequate attention to conflict resolution processes.

Ms **Mariana Hepp** addressed the issue of "Health from an environmental point of view". We have overcome almost every obstacle of nature, she stated, we have gone very far on the path of knowledge. Yet, one can wonder if progress has served humankind, and brought him peace and joy, or rather if it has not made him unhappier. Depression is the third leading cause of loss of healthy years in the world – and these figures are likely to get worse. We cannot consider human beings independently from their environmental context, which include a broad variety of issues, from genetics to inter-human relationships. By intervening in our environment, we affect other human beings, in the present and in the future. The definition of health is difficult. Hippocrates thought that, in order to understand the disease of a patient, one needs to spend time at his home, to see what he drinks, eats, breathes, how he lives, who his friends are, etc. Many feelings of illness are actually only healthy reactions of the body. The immune system is always adapting to respond to environment stimuli, for example in lung cancer. Our way of life has to comply with the evolution of the environment. All the attitudes that promote understanding are necessary to survive. Hence, we witness the development of new genes. Today's medical approach is not holistic. Yet, we cannot understand illness just by examining one organ. Medical students realize that they are distancing themselves on a daily basis from the ideal Hippocratic model. In this regard, bioethics has many roles to play: regulate, build consensus, educate, promote. Ethics should also be understood as an everyday issue. Bioethics responds to the societal need to regulate the lives of human beings. Its fundamental role is in preventing sickness, promoting healthy lifestyles and harmonious relations. This, Ms Hepp claimed, defines a task for physicians, and implies the in-depth integration of bioethics in medical studies. Ms Hepp concluded that, thanks to modern knowledge we can have a core comprehensive approach to human healing, especially considering that we have a biological inheritance of collaboration between each other. This cannot be in contradiction with human culture. She finally added that more such discussion forums are needed, and thanked UNESCO, COMEST and the Brazilian Government for this extraordinary opportunity.

Ministerial meeting: Sharing experiences on the Ethics of Science and Technology

Opening the Ministerial Meeting devoted to sharing experiences in the domain of scientific and technological ethics, H.E. Mr **Roberto Amaral**, Minister of Science and Technology of Brazil, recalls that the highest authorities of Portuguese-speaking countries are gathered around the table, having accepted the invitation of Brazil. All of them contributed to the success of this meeting. These countries will try together to create a common agenda to put science and technology at the service of the development of their respective countries. Ethics is a very serious thing. The action of the States has to bear legitimacy, responding not only to Governments but also to civil society. Ethics, humanism, solidarity, co-operation and the fight against hunger are at the forefront of the new policy of Brazil. Science and technology need to work together for the inclusion of everybody and be a fundamental stage for co-operation and development. As for knowledge, it is obvious that we all live in the knowledge society. Mr Amaral believes that a broad concept of society should prevail vis-à-vis the limited perspectives of power. We all should be more concerned with people, mainly those more marginalized. Many have been excluded from prosperity; they are the victims of the historical processes in the countries. We have to overcome the era of colonization and leave the concept of slaves behind us. In those times, science and technology were not on the side of the poor, the oppressed, and the subjugated. Today, these should not once more become weapons for the rich. They should serve the interest of the people. Only an international ethics, negotiated multilaterally, could change this picture. 'Better late than never' could be the point of view to adopt. Though it may be difficult to find a shared ethics, we should still strive for it. There are many symptoms of imbalance. We do not want to promote the distorted ethics of the strongest, but rather the one stemming from mutual dialogue. As for commonly shared values, we need to call for knowledge sharing without privatization. We now have a consolidated democracy, which will lead to structural reform. We need to be present in the international panorama with full legitimacy to talk about ethics. The Brazilian Authorities were happy to know that UNESCO wanted to hold the meeting in Brazil, so as to hear from the Latin American people and be a partner. The era of knowledge is here. Science and technology are crucial to determining patterns of power. The heated debate in Brazil on national legislation to be applied to GMOs shows how this debate entails political, social, and economical outcomes. This is even truer for those technologies having a double use, military and social. The evolution of the international consensus on the use of GMOs established links between challenges and benefits. All this requires investments that Governments should be ready to make. Knowledge is now mostly concentrated in rich countries. Latin American people will have access to knowledge only by bringing it to their own countries. Indebted countries in the Third World should have access to these technologies and increase the international circulation of science and technology to reduce their cost for countries that cannot generate this knowledge. In order to fund this there is a need for a large amount of capital and a solid law. Latin American governments should obtain the support of the international community

to do a debt swap, so as to invest their resources in this field. UNESCO affirmed that it stood ready to take up these challenges and organize a dialogue. The proposal is therefore that external debt be used to open a door to the future, to reduce stagnation, external dependence and lack of growth. The concentration of science and technology in the hands of a few is probably one of the major threats to development. The debate on science and technology should be brought to the sphere of international relations. A dialectic should be put in place from the vision of a single set of principles to a shared vision of multiple values. Seeking a set of universal ethics does not mean imposing the values of the strongest but rather, to wisely accept the other extremes with pragmatic relativism. We all should work towards the construction of an international ethics based on shared values and built consensus. This would indeed be a universal exercise of science and technology. In this view, the Rio Declaration on the Ethics of Science and Technology will constitute a common platform and will reflect the values that are shared.

Mr **Pierre Sané**, Assistant Director-General for the Social and Human Sciences, having thanked the Ministers for being present at the Regional Meeting, presented the UNESCO strategy in the field of ethics of science and technology for the biennium 2004-2005. Support is granted to four international bodies, the International Bioethics Committee (IBC), the Inter-Governmental Bioethics Committee (IGBC), the Inter-Agency Committee on Bioethics, and COMEST. Different kinds of actions will be pursued, i.e. research, dissemination, education, capacity-building and playing an advisory role, normative action and international co-operation. UNESCO research action aims at preparing 'state-of-the-art' studies, by trying to list everything that has been achieved by academics. UNESCO analyses national laws and regulations, as well as social, economic, and historical trends, trying to build global reflection on the current status of the world, with a particular emphasis on its cultural and scientific aspects. The aim of UNESCO's research is to indicate what can be done and what should be done. This includes what UNESCO should do, what UNESCO could provoke or simply recommend, and what the decision makers could do. The research carried out in the ethics of science and technology can be split in two groups. The first group is the research on the global framework for ethics of science. Ethics of science and technology is a new discipline. Hence, our action has to stimulate the development of ethical reflection. We cannot imagine that we are going to solve concrete ethical problems if our general ideas on the guiding principles are not clear. Of course, UNESCO research also addresses more specific and urgent issues, as always with a view to act by dissemination, capacity building or normative action. This second group of research topics notably contains nanotechnology, cloning, genetically modified organisms and ageing, all of which need better understanding and comprehensive actions. The idea to develop codes of conduct is also a topic for our research, with the underlying idea that even scientists and astronauts are submitted to ethical demands. A new series of conferences, Ethics Around the World, is being started. There, UNESCO will present its research, the work of COMEST and of IBC, and invite local experts to discuss matters specifically relevant to the region. Dissemination also implies publications. A UNESCO series on Ethics of Science and Technology will be created. Other resources, such as information kits, are being made available. Education is at the core of UNESCO's action towards a peaceful world respectful of fundamental rights and human dignity. An Ethics Educational Programme is therefore being launched. Two ethics teaching pilot projects, in Latin America and Eastern Europe, will be started, with the creation of Schools for Ethics, the first of their kind. As for universities and higher education, UNESCO will promote the teaching of scientific ethics, support academic events, particularly in Latin America, not to mention the creation of UNESCO Chairs, including UNESCO Chairs for ethics of science and technology. As far as capacity building is concerned, a Global Ethics Observatory is being

created, a database of organizations, contacts, experts, that will help UNESCO tremendously in any future action and in its advisory role to Member States. The creation of a Regional Bioethics Information and Documentation Centre for Central and Eastern Europe will be supported, and networks developed, for instance between existing national ethics committees. In fulfilling its advisory role, UNESCO strives to make its expertise, and that of the networks, available to Member States. This implies helping to determine the ethical issues specifically relevant to each region, as well as to incorporate international instruments into national laws. As far as normative action is concerned, UNESCO aims at drafting a Declaration on Universal Norms in Bioethics, and to contribute to the elaboration of a convention against human cloning, a United Nations initiative. The feasibility of a Declaration on Outer Space will also be analysed, together with the viability of a code of conduct for scientists. To summarize UNESCO's strategy, there is one objective reflected by all these activities: building the case for ethics of science and technology throughout the world. There are two priorities in the fulfillment of this objective: normative action, with the four declarations that will hopefully be adopted; and the educational programme, supported by the action in research, dissemination and capacity building. Mr Sané concluded by thanking everybody for sharing UNESCO's endeavor toward ethics of science and technology, giving rise to a scientific responsibility that concerns us all. It is thanks to the enthusiasm shown at this Session that the ethical demand will prevail in the world.

Mr **Jens Erik Fenstad**, having taken the floor in his capacity as Chairperson of COMEST, recalled how in 1999 UNESCO, with the cooperation of the International Council of Science (ICSU), held a World Conference on Science - "Science for the Twenty-First Century - a new commitment." The Conference, attended by more than 150 nations, adopted a "Declaration on Science and the Use of Scientific Knowledge", later also adopted by UNESCO Member States. and has served as an important guide for further action. The Declaration notes the rapid advancement in science and its applications and calls on the nations and scientists of the world to use this knowledge from all fields of science in a responsible manner to address human needs. But the Declaration also notes that there are dangers involved. It is not only the efficient use of science that is called for. It is the *responsible* use that we need. He thus gave a brief overview of the new challenges in the ethics of science and technology, which also correspond to the new fields of interest of the Commission. There is often a dramatic tension between 'good' and 'bad' uses of new scientific concepts, theories and methods. Furthermore, an obvious problem is deciding who is to determine what is good or bad, e.g. scientists, politicians, the general public. The ethical challenges are manifold: to construct a coherent ethical position that covers a wide variety of related issues; to balance emotional reactions against rational arguments; and, last but not least, to properly understand the scientific facts that underlie the situation. Hence, he provided some specific examples in the fields of biotechnology, nanotechnology, information and communication technology, brain and cognitive sciences, environment, and sustainability. In response to the problems raised by the new trends in science and technology we have seen a shift from *freedom* and *trust* to issues of *responsibility* and *accountability*. This means a new emphasis on the ethics of science and technology. He then addressed the issue of scientific uncertainty and the public dialogue. To a decision-maker, uncertainties are at least as important as the specific insights gained. It is thus vital that relevant uncertainties are communicated in such a way as to reflect their importance in the decision-making process. However, scientists typically have little training in making visible the things they do not know, or that might turn out otherwise than predicted. To the extent that science fails to communicate relevant uncertainties, it fails to provide trustworthy information. This is an important issue to be addressed. In the same vein, COMEST has taken up the challenge by establishing a

working group to give the necessary advice on how to integrate an awareness of and competence in ethics and the responsibility of science in the training of every young scientists. The central aim of the teaching of ethics should be to develop students' ability to recognize and analyse ethical issues in order to be able to reach decisions on how to act ethically. To conclude Mr Fenstad expressed the hope that his remarks may be of some use for the preparation of the Rio Ministerial Declaration on the Ethics of Science and Technology.

H. E. Mr **Tullio del Bono**, Secretary of Science and Technology of Argentina, conveyed to all present the greetings of his Government. We are living in a changing paradigm of the industrial society, and entering into the knowledge society. Nowadays, the major product is knowledge, instead of machinery. We are determined to do under this paradigm better than we did under the last. We want to build the capacity to generate, distribute and make good use of knowledge. Why do we need this knowledge? There are three main problems. First, if it is true that current knowledge is the basis for future knowledge, we cannot quite make use of cutting-edge knowledge. We need the right to appropriate this knowledge. Second, Paulo Freire taught us that knowledge is a collective construction. We need instruments to appropriate knowledge and break scientific illiteracy. We need no computers to be given to people who do not know how to eat. We need preconditions to be put in place. We need the necessary capacity to appropriate the knowledge available. Third, is the capital importance of human resources, as it generates knowledge. Brain drain is a serious problem. In Argentina, brain drain is equal to the value of the foreign debt. To face these challenges political decisions and resources are needed. Argentina welcomes the proposal of Brazil to swap debt for knowledge and believes that UNESCO should help in preparing a document for financing such educational, scientific and technological development. Actually, ethical problems are at the basis of the world-changing technology. Science and technology should mainly help to include the excluded, and improve the living conditions. In the quest for universal ethics, focus should be placed on regional ethics as problems common to the region are what must be faced first and foremost The region should plan together, create and design a common future, a vision of a common future, and create the necessary tools to apply it. UNESCO should indeed be of help in doing this. Ethics committees that work at the regional level are needed to help the region to address most of its common problems in an ethical framework. As final reflections and proposals, it should be highlighted that Argentina has suffered, like many Latin American countries. In the region, there have been divisions in the past. But now Argentina is here to ask its partners and neighbors to join efforts and design together a common future, with the hope to use science and technology to make this common future a concrete undertaking.

H.E. Mr **Luis Alberto Lima**, President of the National Council of Science and Technology of Paraguay pointed out that this meeting was very timely, due to the importance of such an issue nowadays. Science and technology have an important impact on society as they affect all activities, and thus development, in the areas of education, sanitation, environmental, science and culture. Each society creates its own cultural, moral and ethical patterns. This causes divisions. Morality is a code adopted by the society, on which there is shared consensus. Ethical principles include everything dealing with the survival of human beings. The struggle against poverty is a struggle in favor of human rights. But often those who struggle are also those endangering life, through weapons of mass destruction and threats to the environment. Indeed, globalization has built the knowledge society, but it has also generated an imbalance. This is closely related to the limited investment in science and technology. We need to avoid concentration of knowledge in certain countries, as it is in fact a matter of common heritage. We support the idea of swapping foreign debt for

knowledge, especially knowledge related to new technologies. There is a need for mutual solidarity to improve social and economic development. This is the main ethical issue at stake.

H.E. Ms **Maria del Rosario Guerra**, Director of the Colombian Institute for Development of Science and Technology of Colombia, shared the experience of her country in management of ethics and teaching of ethics. In recent years, such a debate has indeed grown up. There is an ever-increasing fear that, with these technologies, the exploitation of weak countries could increase. In this regard, a law was issued to set a scientific standard. It is also important to envisage the creation of ethical committees, which would guarantee the conformity of each project undertaken with the standard. As for ethics and education, the education of citizens in the attempt to build up common values is of high importance. Each citizen is an active participant in the production of a common destiny. A better society presupposes education of pluralist subjects for the search for peace. Research projects in education for democracy are increasing in the country, starting from primary education. Ethics and human value is also a subject being incorporated into academic curricula. Family welfare is also a major concern. A Society for Peace was created to contribute to citizens' education. Science should be a shared good. Scientific research and knowledge must respect human rights. Colombia is committed to guaranteeing access to scientific resources so as to guarantee the well-being of all humanity and is concerned with its responsibility to future generations. Colombia has been setting up a number of ethical standards covering scientific research. Now it is important to focus on the different regulations between developed and developing countries, without overlooking the crucial problem of brain drain.

H.E. Mr **Benjamin Marticorena**, President of the National Council of Science and Technology of Peru, recalled that, modern science was born as an aesthetic exercise without ethics. The products of science cannot be used if they do not lead to the benefit of people. Science has to go hand in hand with a strong educational program, so as to develop critical thought, and commitment to truth and solidarity. The challenge is to ensure the survival of the species and the happiness of people. The declaration being discussed is a very valuable document and has important concepts related with all the issues that the region has been dealing with. Now tolerance is needed, without forgetting that being tolerant with something that is not true is in fact not being tolerant. We have to seek improved quality of life and well being of people beyond economic reasons. Science in itself does not have any ethical meaning apart from the search for truth. Instead, the use of related technology demands constant surveillance. Peru is glad to adhere to the document proposed by the Brazilian delegation and considers it as one step closer to achieving sustainable development.

Presentation of the Draft of the "*Rio Declaration on Ethics in Science and Technology*"

Ethics is to be considered the guiding line of international relations, the leading idea to overcome existing imbalances among different countries. The present Declaration takes into account a number of documents, such as the Framework for Action of the World Conference on Science (Budapest, 1999), which have been discussed and approved by the United Nations. This Declaration is a manifesto on behalf of the sovereignty of some countries, which should be fully autonomous from this point of view. Funding of knowledge should indeed be a democratic process. From this perspective, again, the proposal to use a share of the external debt to fund the development of science and technology is renewed.

The Draft Declaration was read. The text was to be openly discussed, an innovation from closed door negotiation to address the need for dialogue and global acceptance. After the discussion, the

text will have to be redrafted and maybe the wording would be different. Once suggestions were submitted, the making of modifications would be entrusted to the rapporteurs. Colombia shares the spirit and content of the document but had some observations on the form and content and proposed four amendments. Paraguay asks for more prominence to be given to the regional dimension so as to better meet regional standards and asked questions about the recommendation on terrorism. Brazil answered that this came from a specific request to control information on the Web. Peru supported the point of view of Colombia. Regarding free software, Peru pointed out that its Constitution did not allow specific software to be fostered for any reason. Peru also pointed out that standardization of digital TV was a very broad topic and needed further discussion. It also found manufacturing low-cost PCs to be a very interesting prospect. Peru fully shared the proposal of databanks on patents and scientific and technical knowledge. It drew attention to the promotion of individual freedom in the struggle against terrorism. Brazil called for support of programmes which developed free software, among other initiatives. Colombia felt the need to first consult its domestic regulations on digital TV before signing the Declaration. To this, Brazil proposed that a vaguer and more general reference to digital technologies be used. Argentina was in favor of considering the Declaration as a tool for action with no strict focus on words but rather on the action that it would generate. It called on UNESCO to develop books and syllabi to support science education and stressed the importance of generating knowledge that leads to innovation. Argentina brought up the example of Japan as successfully incorporating worldwide knowledge and innovating. It called for the development of national and regional copyright and requested UNESCO's help in this. Argentina raised the need to protect human knowledge, need to protect the region's scientists. Repatriation would not be a realistic solution, but networking with these human resources is possible. Argentina pushed for the establishment of regional centers and clearinghouse databases. On external debt, Argentina pointed out that, in order to pay, countries have to grow; they cannot pay by starving their people. This message was also conveyed in the inauguration speech of the Argentinean President on May 2003. It asked UNESCO to help in preparing a final proposal on external debts. Brazil asked that all Argentinean proposals be taken into due account. A member of the audience asked for more importance to be given to the teaching of ethics as there was a lot of interest in this topic and it certainly deserved a separate paragraph. An observer asked that a reference to the protection of labor structure in countries with a strong monopoly be included. Portugal made a proposal to have a Women's Forum.

Closing Session

Mr **Henk ten Have**, Director of the Division of Ethics of Science and Technology, UNESCO, presented a summary of the debates, starting by summing up the key concepts of the keynote address of the opening session, ie that the ethics of science and technology is indeed an issue at the borderline between science and humanities, and every time the current status of science is discussed, or the impacts of technological development assessed, the future of humanity is at stake. A new encounter of science with ethics cannot be successful but under the aegis of a shared responsibility, and the respect for human rights. Educational ethics is key to the ethics of science, inasmuch as science ethics largely relies upon awareness building: ethics is not the property of ethicists, scientists or any other category. Starting with the biennium 2004-2005, schools for ethics will be established in Latin America and Eastern and Central Europe. Environmental ethics is another major concern and a priority, being among the UN Millennium Development Goals. There is a hope that the recommendations of COMEST will be helpful in this regard, as well as the establishment of the RENEW network to share best practices in freshwater management. In the future, the water issue will be integrated into the reflection on sustainability. As for space ethics, the successful co-operation with UN-COPUOS and other agencies was recalled. In building the case for space ethics, there is a need to convince at the same time the space community, philosophers, ethicists, other scholars, and the public at large. The aim in this biennium is to work towards a universal declaration on space ethics. To this end, a feasibility study will be carried out and presented to UNESCO's General Conference in 2005. Besides space ethics, also science ethics will also receive more focused attention. Following a UN Inter-Agency proposal and the mandate received during the World Conference on Science (Budapest, 1999), COMEST will devote its efforts towards the possible definition of a code of conduct for scientists, with the conviction that science as such is no more neutral than medicine, and a code, if not an oath or pledge in the Hippocratic style, can be sought. This is evermore necessary also in light of the recent concern about increased (bio)terrorism threats. Scientific responsibility is a value to be fully recognized in order for people to regain trust in science. Also for this reason, and with the full involvement of the scientific community, a study will be carried out with a view to receiving a definite mandate for the elaboration of a declaration. New topics will also be tackled, such as nanotechnology and research with human beings. Relevant ethical concepts have to be elaborated to properly address these new issues. This is but a further illustration of the growing need for ethical reflection. The important issue of Sustainability goes along the same lines. The COMEST working group on the precautionary principle constitutes a unique opportunity to analyse a most fundamental ethical principle, which comes into play in this field. The side events at this session were more important than ever. Again, the Youth Forum brought a fresh point of view both to the audience and to the Commission members, demonstrating once more the importance of involving young people and building long-term awareness in ethics of science. The Ministerial Meeting was a key opportunity, fully utilized, to involve decision makers committed to making ethics a concrete undertaking and not just a philosophical reflection. The Ministerial Declaration on the Ethics of Science and Technology, which was signed by the Latin-American countries and the Community of Portuguese-speaking Countries, constitutes an unprecedented success in this regard. The COMEST looks forward to communicating and debating about the results of its biennial work at

its next session, to be held in 2005, possibly in Thailand.

Mr **Pierre Sané**, UNESCO Assistant Director-General for the Social and Human Sciences, warmly thanked the Government of Brazil for kindly hosting the meeting which provided an occasion for reflection and debate on the moral and ethical issues raised by the advances of science and technology. UNESCO greatly appreciate the Brazilian support for UNESCO's endeavor towards ethics of science and technology, a clear sign that Brazil is one of the few leading countries in the world in the field of scientific ethics. He paid tribute to the memory of Mr Odhiambo, a deceased member of COMEST who was a pioneer in science ethics, displayed exemplary awareness of the implications of scientific innovation, and the importance of its fair and wise distribution. Mr Sané also thanked the members of COMEST whose mandate would finish at the end of 2003. The Commission would surely miss the energy and authority of Mr Sarukhán and Lord Selborne, and their special influence on COMEST's work regarding environment and water respectively. Mr Curien contributed greatly to an in-depth reflection on science policy; Mr Ninham and Mr Kapitza represented the very stimulating points of view of fundamental physics and applied mathematics. Their influence was surely determining. Mr Sané wished them to stay close to COMEST reflection and action in the future, and thanked them all. He thus congratulated the Chair of COMEST, who had given a significant impulse to ethical concern in science and technology, contributing to a greater awareness of ethical issues in the world, and in the scientific world in particular, disseminating the recommendations that COMEST adopted in Berlin on the ethics of outer space, of fresh water, and of energy. A further questioning on space ethics issues had been encouraged, laying the foundation for promising international cooperation regarding space law and space ethics. Moreover, the development and action of the RENEW network for ethics of water has been promoted and debates and activities initiated on new issues such as sustainable development, precautionary principle, and ethics teaching.

The whole of modern history is made of a gradual rise of the power of man over the world and nature. The middle ages ended when man ceased to be afraid of nature, and began dominating it. But that process has gone so far that nature and men are now afraid of man and his power. The earth seems to have become too small to support our consumption. We now have to recognize that we are in a situation of strong inter-dependence with the world that we live in. Issues such as water, outer space, energy, teaching - all these questions predate COMEST. But what COMEST brought is the ethical point of view on these. It implies, in particular, that these questions should not be left to experts of any kind. There is a normative aspect in ethical work of course. But what do norms mean if they are not "in the minds of men", to quote UNESCO's Constitution? Thus, the value of COMEST work, its relevance to the world, lies also in its contribution to awareness-raising. We should all participate this effort. Ethics in general is not the property of any one commission or organization. We must all feel responsible for the worldwide respect of this ethical necessity.

The Chairperson of COMEST, Mr **Jens Erik Fenstad**, took the floor to thank the speakers and the participants. He also wanted to acknowledge the support provided by the Secretariat, and congratulated the Latin American Ministers, expressing his satisfaction that they came to an agreement. He then thanked once more the Brazilian authorities, for their hospitality. Finally, he expressed thanks to H.E. Mr Roberto Amaral, Minister of Science and Technology, to whom he gave the floor for the explanation, signature and reading of the Rio Declaration on the Ethics of Science and Technology.

H.E. Mr **Samuel Pinheiro**, Brazilian Vice-Minister for Foreign Affairs, having greeted all the participants, made some remarks on science and

technology in the Brazilian perspective for economic and social development. Development means transforming the economy and society as a whole. This transformation can be reached by exclusion or inclusion. The need for inclusion was already stressed; otherwise development would not be called as such. The present ideological trend favors speed and individuality. But for development to be ethical and effective it has to be inclusive, promoting transformation and social cohesion among the various layers of the population, and has to respond to the expectation of the majority of the population without disappointing the minority. Scientific and technological development and knowledge should not be devoted to abstract purposes but should focus on the needs of the majority of the population. There will be no scientific and technological development without working for peace. This is the direction that Brazil has been pursuing in its foreign policy. The importance of renewable energy is crucial, to prevent misuse of energy which would neglect future generations and the environment. The focus of COMEST on this issue is highly appreciated. The same is true for poverty, which is also a central priority of the Brazilian Government. Any transformation has to be beneficial to society. Developing science and technology with countries in the Region that share the needs of Brazil remains a major concern. Holding the Round Table of Ministers on this occasion was timely indeed.

In closing the Session, H.E. Mr **Roberto Amaral**, Minister of Science and Technology of Brazil, having thanked all the participants, thanked UNESCO for having accepted to enlarge the scope of the COMEST session to host the Ministerial Round Table. He recalled again the important sign that UNESCO has given through its readiness to listen to the voices of the Latin American continent and its willingness to contribute and to help in carrying out appropriate transforming actions.

He announced that the text of the Declaration would soon be read and signed and underlined the importance of this moment, as it would be the first contribution of the developing countries to such a theme. Here the discussion was not only on science and technology, but on life, on the future. The developing countries want to master their own culture, he said; to reach a better understanding of their own realities; to be able to modify it, determine it; give life to a new society based upon social equality. This Declaration is the developing countries' challenge to the industrialized countries. It is the irrefutable proof of their competence in the domain. The developing countries want to participate to the building of consensus so as to increase the circulation and the responsible use of science and technology; to counter the limited scope of the interest of those countries merely focused on commercial interests.

After these words, the Rio de Janeiro Declaration on Science and Technology was read and then officially signed by Argentina, Brazil, Colombia, Paraguay and Peru. Other countries in Latin America and the community of Portuguese-speaking Countries would officially endorse it in the following days.

The signature of the Rio Declaration brought the Third Session of COMEST to a close.

ANNEXES

Roberto Amaral: Ethics in scientific knowledge as an instrument for the development and welfare of peoples

Brazilian Minister of Science and Technology

Ladies and Gentlemen Ministers and High Officials,

Distinguished Colleagues, Scientists, Researchers and Representatives of the Academic Community,

Ladies and Gentlemen,

The coincidence of these three events – the Third Session of the World Commission on the Ethics of Scientific Knowledge and Technology, the Meeting of South American Science and Technology Ministers and High Officials, and the Second Meeting of the Science and Technology Ministers from the Community of Portuguese-Speaking Nations – did not occur through random chance, nor was it derived from pragmatic decisions to save time and resources. From the moment we declared our Country's disposition to host the Third COMEST Session – the first such event to be held outside the European continent – we were convinced that this would be a unique opportunity to assess the ongoing debate concerning the ethical references needed to guide scientific and technological development, as well as the use of the knowledge obtained through such development in order to further the welfare, peace, and integration of peoples everywhere, fundamentally on behalf of human beings, through the construction of less unjust societies which strive for equality.

Also contributing to the success of this meeting is the equally uncommon fact that scientists, researchers, politicians, scholars and philosophers, along with the policy-makers for scientific and technological development, are gathered together at the same place and time, which should be taken as an expression of our mutual intention to democratize the use of knowledge which is now, more than ever, a tool for progress.

Knowledge sets human beings apart from all other manifestations of life on our planet; because our knowledge permitted our conquest over labor – the efforts of primitive human beings to transform their surroundings, mastering nature to their benefit. And, through language, they came to command these efforts as Homo sapiens, becoming a source of a new understanding among beings of the same species, no longer based simply on survival instincts but rather, to a far greater extent, based on relationships of respect and mutual solidarity.

Unfortunately, the advance of knowledge was not homogeneous for all Humanity. This is not the suitable venue to debate whether this anomaly elapsed on its own or through the imperatives of physical and psychological conditions. Whatever the reasons might have been, human beings conquered the land by garnishing an insatiable appetite for dominion over the available wealth, without taking into account the pain and suffering of their fellow human beings. It has always been the law of the strongest, of might makes right, the dialogue between the wolf with the lamb symbolized in La Fontaine´s immortal fable. But at the same time, humanity – through its process of self-construction – was weaving the rules of society, crucial to our very survival, codifying them as Ethics, the highest of standards, the vertex of development, justification or condemnation for the acts of human beings, fulfilling their role as builders of the world.

The notion of good and evil, the subordination of our acts towards an end, the existence of an ethical standardization that is valid independently of the positive right, constituting an axiology and creating a teleology that justifies life: these are the very elements that paved the way for the transition from barbarie to civilization.

The United Nations Educational, Scientific and Cultural Organization – UNESCO – under whose auspices and inspiration COMEST was created, enjoys the utmost respect and admiration of the Brazilian Government and people, not only for the principles it represents but also for the undaunted work that is being realized in the sense of its contributions, in the name of ethics, to breaking down the obstacles that continue to hinder access of the vast majority of humanity to the fruits of progress and fundamental rights for which they have so valiantly struggled and wish to consecrate. Such exclusion is unethical, as nothing is more profoundly unethical as hunger.

For us, Brazil's science and technology policy-makers, it is encouraging to see UNESCO's inspiration and support for the policies of change being spearheaded by President Luiz Inácio Lula da Silva, whereby we hope to make qualitative strides in the near future, towards a just society, a yearning shared by all of us.

For this reason, we must not only undergo and consolidate the structural reforms brought on by a new political vision, but also combat all forms of social exclusion – a reflection of the unjust distribution of wealth and of the intangible assets that knowledge represents, the grand legacy aggravated by neoliberalism.

This objective – seemingly so distant and difficult, seemingly as intangible as the horizon which insists on moving further away the more we attempt to reach it – will only be attained through our people's rallying around a common desire for change, inspired by our commitment to democracy, in defense of peace and dialogue and, above all else, by placing of greater value on human beings.

President Lula has made great strides, using his constant pilgrimages not only to strengthen economic, diplomatic, and political relations between Brazil and other countries, but also to establish new bonds of brotherly friendship, mutual knowledge, and effective cooperation across all fields. His greatest objective is the coming together of our peoples.

Such a project of change cannot be made feasible without the simultaneous existence of a scientific and technological framework capable of generating new ideas in all realms of knowledge and of putting such ideas into practice through original technological innovations, which requires the mastering of increasingly sophisticated knowledge and methods.

For these reasons, the new Brazilian Government has undertaken a reformulation of our research structures, by modernizing facilities and laboratories, removing barriers and, above all, making our country a better place to work for the increasingly large numbers of people embracing scientific and technological careers, and whose competence and wisdom depends, for the most part, on the success of all of our projects.

This is not just about simply creating the right conditions for research, but rather conquering the right of our countries to full access to knowledge that, by definition, comprises the heritage of humankind, as well as assuring our people access to the goods generated therefrom.

If we do not adopt a vigorous policy of support for scientific and technological development, and if we are not able to bring our industries to make the unavoidable choice for a direct and profound involvement in technological innovation, we will be accepting a progressive and irremediable dependence on the original ideas of wealthier nations and condemning our peoples to the

condition of consumers of second-hand knowledge and products.

Preventing this scenario of dependence is not an easy task. It implies that our governments must adopt innovative policies, make large-scale investments in the talents of our researchers, provide incentives, through appropriate means, for the full involvement of the business community, and successfully forming the international management committees necessary to break through the limits and barriers that have been imposed on us. I am certain that, to the extent possible, President Lula's administration has been setting examples of what can and should be done.

These are problems common to our countries – to a greater or lesser degree – which can and must be overcome, not only through the exchange of successful experiences but also through an ongoing manifestation of solidarity around the same set of ethical principles, reflecting our regional realities in the fields of science and technology and how science and technology are put to use towards social and economic development; a social and economic development that is not self-explanatory nor justified by means of statistics, but rather through the extent to which it contributes to the happiness of human beings.

And the starting point can be none other than acknowledging that the exclusion of portions of any country's society – or the exclusion of entire groups of developing countries – from the fruits of democracy and civilization (among which is knowledge itself, in all its manifestations) constitutes, above all else, a problem of ethics. In the struggle against Aids and other diseases that decimate populations in Africa, Asia, and Latin America, an ethical vision must be one that focuses essentially on the survival of human beings and not one that prioritizes defending patents on medications. We would imagine that the countries that manufacture and market land mines feel directly responsible for the suffering of millions of adults and children victimized by such products.

Ladies and Gentlemen:

Ever since January, when I was distinguished by President Lula with the honorable mission of heading up the Ministry of Science and Technology of my Country, I have been striving to lead a process of change in the national system of science and technology, from an ethical-humanistic standpoint and with the objective of contributing, in our realm of work, to the solidification of a societal design founded on overcoming regional inequalities, eradicating poverty and hunger, and extending the benefits obtained from advances in science and technology to all citizens. If we are all equally Brazilian, then we all enjoy the same rights.

To an increasingly greater extent, the borders of knowledge demand concerting and solidarity actions, in seeking synergies and complementary activities that empower national research efforts and scientific and technological development. Such efforts require firm and constant support from Governments, in such a way that the national scientific communities can obtain the greatest benefits from international cooperation based on joint and shared work, through partnerships that use the best of their potentials and produce results far greater than the sum of their individual efforts.

We have been registering progress in cutting-edge research and state-of-the-art technology, and will continue to pursue even bolder objectives in the fields of biology, physics, chemistry, and mathematics, with particular emphasis in areas such as biotechnology, nuclear research for peaceful uses and alternative forms of energy, nanotechnology, and space research, among others. But we will never lose sight of those excluded from our societies, Brazilians as we, many of them deprived not only of access to knowledge, but even to fundamental rights such as food and basic healthcare.

The wealthier nations never miss an opportunity to express criticisms to the scenario of inequality found in less developed countries. Such criticisms are valid to the extent that they emphasize the indispensable character of respect for human rights and the values of a truly democratic society. But they often take on an undisguised air of hypocrisy because these same wealthy countries insist on maintaining an economic order that feeds the causes of such inequality. They also forget that internal inequalities and contradictions, which concentrate rights in the hands of the few, are repeated in much the same way, shape, and form on the international level, in comparisons among countries.

In fact, a gap even more profound and insurmountable than currently found in third world societies is expected to separate the population between the proprietors of science and technology, on the one hand, and segments excluded from knowledge, technology, and education on the other. In this sense, the so-called "digital gap" will be yet another exacerbating element of this frightful prospect.

If it gets to this point, the countries without adequate scientific and technological qualification, which represent the vast majority, will very soon be doomed to purchase, at the price of gold and under subservient conditions, access to such science and technology that countries holding such resources are willing to sell. In many cases, these technologies won't even be available for purchase, particularly those which present potential access to closed technological clicks by non-member countries. And worse: the controls exerted by developed countries over dual-use technologies, including the areas of nuclear energy and outer space, are being stepped-up with intentions that go beyond national security issues and clearly advance into the realm of trade.

However, these controls are political much more than commercial.

This is the case with dual-use technologies, such as those necessary for launching satellites, subject to unilateral schemes of safeguards dictated by the United States (holder of these technologies), whose terms, in many aspects, ignore the sovereignty of the countries that wish or even need to acquire such technologies for peaceful national programs.

Here in Brazil, we are experiencing a situation in which negotiations over the Agreement of Technological Safeguards for commercial exploration projects at the Alcântara Launch Center, led the previous administration of the Brazilian Government to sign agreements considered by National Congressional Committees as containing safeguards of a political nature that would harm Brazil's national sovereignty. Cited among these safeguards, for example, is the prohibition against usage of resources obtained from future launchings for the funding of our National Space Program.

Political controls also are exerted over the international trade of supercomputers, equipment crucial to the furtherance of research in various areas which can, as it is widely known, be used in experiments and simulations that are potentially a form of strategic military use. The developing countries are often denied access to supercomputers, even under normal trade conditions and signed commitments of peaceful, non-military use.

In the case of nuclear technology, we have the multilateral control enforced by the International Atomic Energy Agency, headquartered in Vienna, and which is part of the United Nations family. Brazil is a charter member of this regime. A disturbing tendency has been observed on the part of the major nuclear powers, in the sense of substituting objective criteria, multilaterally agreed upon, with parameters that leave a margin of doubt regarding the possible political use of the nuclear control regime for geostrategic ends – a tendency that does not appear to be contributing to the promotion of world peace.

Brazil is subject to these controls, and even so has not enjoyed access to the technology that it requires.

That is political control over technology.

In other words, these controls function, according to the latest analyses, as yet another obstacle faced by developing countries in seeking access to much needed technologies.

We defend an international system that chooses tackling hunger and social exclusion as its highest priority; promotes universal quality education, and guarantees healthcare for all; a system that limits abuses of power and that denounces and condemns discrimination, intolerance, and war.

Democracy, independence, respect for differences, the right to peace – our objectives on the national level – must be reflected with equal conviction and certainty on the international level, respecting the not only legal but ethical principle of the sovereign equality of States, including in what concerns the development of autochthonous scientific and technological research projects.

One such platform of democratic brotherhood among nations must be inspired by the universal principles of ethics, symmetry, sovereignty, and social justice, and be materialized through permanent dialogue as well as transparent and efficient policies and actions.

Brazil wishes to deepen its scientific relations in South America and Africa, particularly the Portuguese-speaking countries, with whom we share a common history, language and culture, without discarding our cooperation with traditional partners – the United States and countries of the European Community; and we look forward to stronger cooperation with countries facing challenges similar to ours, such as China, the Ukraine, India, Russia, and South Africa.

Ladies and Gentlemen,

Let us bear in mind that all South-South cooperation efforts in science and technology today must face the barriers imposed by international trade rules, which do not take into account the interests of the community of developing countries and their populations. Such efforts will equally contend with competitive actions from those countries that currently hold technology, as well as their transnational companies, the main beneficiaries of globalization.

UNESCO, which deals with the constituent elements of the "economy of knowledge" (education, science, and culture) has encountered growing resistance to the construction of a developmentalist vision and social justice in addressing these issues. The Organization withstands attacks on its programs for initiatives in the realm of the World Trade Organisation (WTO), where some countries defend, for example, that education be negotiated from a mercantilist viewpoint, in the landmark General Agreement on Services and Trade.

These negotiations are aimed at opening markets to corporations that treat education as if it were just another business. The substitution of the State as provider of a service that due to its social reach should remain public, will promote a corporate education of dubious quality, a channel for sales, at an expensive price tag and serving the market that, as we already know, is not currently nor ever was an instrument of social justice and harmonic development. Its effects on poor countries could be devastating and representative of yet another barrier to the universalization of education, at the exact moment in time when the advent of information and communication technologies, associated with the national programs, promise qualitative forward strides in the educational level of developing countries.

The corporate segments of the digital industry (based on a technology that allows the

inexpensive reproduction of products of information and knowledge) protect themselves against the effective democratization of these components of knowledge, through the questionable strengthening of international regimes of proprietary rights, among other hard-line trade practices. Some international agreements are being revised to accommodate a more restrictive level of protection, closing access to knowledge and reversing a tradition of addressing science and knowledge as a public good at the service of human progress.

The TRIPS Agreement transferred to the WTO various aspects of the administration of intellectual property rights that up to that time had been governed by the more flexible agreements of the World Intellectual Property Organization. That is, the ownership of works of human creativity became subject to a regime of trade rules, which reflects (and protects) greater power in relation to the world's economic powers.

We clearly saw this when we recently attempted to negotiate a flexibilization of the TRIPS Agreement that would allow for the subordination of the intellectual property ownership regime for the imperative of public health.

The process of privatization of knowledge has also made inroads into the terrain of basic science. The so-called "laws of innovation" and similar instruments are promoting major transformations in the relationships between researchers and their employing institutions, private or public. The idea, legitimate in and of itself, is to stimulate the maximum degree of entrepreneurship in the academic-university sectors. The outcome, however, may be that of compromising the transparency and creative freedom present in the very bosom of basic sciences, whence burgeon the original ideas that build science and feed technological progress. Such an idea also constitutes, if taken in its broadest context, a confrontation to the notion of the public treatment of scientific information and the research work generated therefrom, predominantly with State resources and primarily in developing countries with lower levels of education and training and still in want of support by private initiative for local generation of research and development.

We should also examine in depth the fact – curious at the very least – that the gigantic State subsidies granted to research efforts practiced under diverse forms in technologically advanced countries are not considered distorted nor deserving of recrimination by the WTO Agreements. Since current practices assure competitive advantages for the industries of wealthy nations, and since the developing countries will unlikely be able to reproduce these levels and mechanisms of direct support towards research, the WTO, on the contrary, addresses such subsidies as legitimate in principle.

Nor does the WTO call for differentiated limits of research grants between developed and developing countries. In fact, free trade may one day become a work of fiction, sold by the economically stronger countries and unfortunately bought and lauded by the elite of many countries with no resources, no competitiveness, no science and technology and, consequently, no access to markets for the products that they export.

I believe that developing countries should pay greater attention to the treatment given to science and technology in the context of international trade rules and negotiations. A new critical approach to the rules in effect and innovative proposals that "liberalize" access by our countries to knowledge and its benefits are absolutely necessary. We cannot continue to focus merely on the traditional sectors, putting all our efforts towards agricultural negotiations, for example, without expending the same level of energy on negotiating the rules that facilitate the development of science, technology and innovation (all major areas of the future, as all we know) in less wealthy or technologically advanced countries.

I exhort the World Commission on the Ethics of Scientific Knowledge and Technology to contribute to the cause of development by producing studies and offering proposals that defend and apply the principles of ethics towards more fair and equitable rules of international trade, services, and technology; rules that favor the development of science and technology with social inclusion and that improve the quality of life for the populations of our countries.

Ladies and Gentlemen,

COMEST, according to our understanding, has a crucial role to play; and, as we all can see, has the support of the Brazilian Government. Its mission is vast and offers wide-ranging opportunities for the articulation of joint projects in research, establishment of networks, exchange of knowledge, and scientific education. Its contributions to the formulation of studies and policies inspired by universal ethical concepts, covering of broad spectrum of fundamental issues on the international agenda, would represent even further gains.

For Brazil, what sets UNESCO apart is evidenced in its very name, which reminds us of its mission to defend the progress of education, science and culture throughout the world, primarily in developing countries, where, I believe, defending such rights takes on even greater urgency and necessity. We therefore need to work together to resist the process of privatization of science and knowledge that will shut out access to the most highly needed vectors of development.

This Commission will certainly continue working and with even greater tenacity, towards the development of science and research in the Third World, supporting its dissemination and popularization.

The importance of COMEST in defending this cause resides in its power of rallying international public opinion in favor of ethical changes in the asymmetrical process of globalization by defending, for example, a reopening of the debate over the foreign debts of Third World countries.

I hereby propose that a portion of the expenditure that milks our economies for the purpose of paying foreign debt service charges, be amortized by means of investments in projects of education, science and technology.

In this way, we will create the necessary framework so that our countries may take part in the economy of knowledge.

UNESCO gathers here a host of hearts and minds noted for their performance in ethical supervision of the conquests and uses of human knowledge, providing an incentive for conviviality (so important to these objectives) between these remarkable thinkers and those people in positions of political control who have a responsibility to reduce poverty and inequality, in order to gain access to the intellectual archives already available to other peoples, as well as to take part in the search for what much of Humanity still desires to learn about itself, about our planet, and about the universe.

Our statue of Christ the Redeemer is the symbol of our generous and welcoming reception, as Brazilians and Cariocas, that we want to offer this dialogue. And – on behalf of President Lula – we wish to express our ardent desire that Rio de Janeiro may be a venue propitious to generous reflections that include the condemnation of violence, war, selfishness, and greed, as well as the exaltation of peace and boundless solidarity among peoples.

This is the vision of a future in which all will be increasingly rich and prosperous, without the need to push an increasing number of human beings into poverty. Reaching that future will not be easy, and the obstacles in our way will be many. But the awards are so enticing and so reachable that it would not be ethical to abandon the struggle.

Marcio Barbosa: Welcoming address

Deputy Director-General of the United Nations Educational, Scientific and Cultural Organization (UNESCO)

Excellency,
Distinguished Participants,
Ladies and Gentlemen,

First of all, on behalf of the Director-General of UNESCO, I would like to thank the Brazilian Government for hosting the third Session of UNESCO's World Commission on the Ethics of Scientific Knowledge and Technology (COMEST). It is the first time that a formal session of COMEST is taking place outside Europe, inaugurating a new approach to the global debate of the ethics of science and technology by bringing it to the regional level.

Thanks to the generous offer of the Brazilian Minister of Science and Technology, Mr. Roberto Amaral, we are having here in Rio de Janeiro the opportunity not only to organize the Third Ordinary Session of COMEST, but also to surround it by a wider debate involving, on the one hand, young scientists in the Youth Forum on the Ethics of Science and Technology and, on the other, a meeting of Latin American Ministers of Science and Technology, to further debate the same issues from their national perspectives.

Ladies and Gentlemen,

Science has been largely responsible for bringing humanity up to its present level of development. Science has provided us with better knowledge of the functioning of nature. It has taught us how to explore nature in a sustainable way for the benefit of humankind and it has also provided us with the tools to better understand our own behaviour.

Science must be submitted to public scrutiny because societal support is inseparable from public confidence in science and scientists and can no longer be taken for granted.

In this context, the ethical behaviour of scientists is most important in order to reassure society that science is truly beneficial. For this reason I believe that the Session on the Code of Conduct for Scientists is a timely initiative and will provide a good opportunity for debate.

It is the role of UNESCO to provide a forum for this debate, taking into consideration not only the desires of the scientific community but also the views of its Member States, which play quite different roles, at different levels, in the advancement of science and the transformation of knowledge into technologies. The present meeting is clearly focused on the global and cross-cutting issues being examined by COMEST – fresh water resources, outer space, the teaching of ethics, and the ethical implications of research with human beings. It will be interesting to see how this worldwide debate coordinated by UNESCO through COMEST will be enriched by being held in this region, where ethics of science and technology is a growing priority.

Particularly during this Third Session of COMEST, there is a point that I would like to highlight and welcome: the new emphasis placed by COMEST on the importance of the training of researchers in ethics, in particular at the university level. You will recall that the COMEST Working Group on Ethics in Research Training, after two meetings in Paris in January 2003 and Oslo in May 2003, prepared a report on *The Teaching of Ethics*. This timely report, which will now be made public, echoes the growing concern worldwide about the importance of teaching ethics. For the developing countries, for instance, it is particularly

important to build up competences in the field of ethics so that they can better address such matters as unfair trade agreements, the takeover of natural resources, the patenting of biological material, and the introduction of plants or cultivation methods that can harm traditional ways of life, cultures and livelihoods.

The report, I notice, proposes the implementation of a specially adapted set of programmes, topics of study and teaching methodologies in the ethics of science. Those recommendations, which urge UNESCO and other international organizations to develop partnerships, establish fellowships and support ethics teaching where the need for competence in ethics is especially pressing, will be given serious attention by UNESCO.

As a result of strong requests made by Member States during the recent 32nd session of the General Conference, UNESCO is now in the process of enhancing its educational action in the field of bioethics. This will include, in particular, fresh attempts to develop model teaching programmes and certification systems, generate improved teaching materials and UNESCO Chairs in bioethics, among other initiatives.

This new shift will also include the development of specific awareness-raising campaigns on the importance of bioethics targeted at both professional circles and the general public. For this purpose, UNESCO will need to use existing networks, such as COMEST, in order to stimulate debates on key ethical issues at national and regional levels.

I am confident that COMEST members will engage in those exchanges and discussions and will continue, therefore, to function as an active intellectual forum while disseminating relevant information on all ethical and legal aspects related to the advancement of science and technology.

It remains for me to wish you a fruitful debate and, once again, I thank you for assisting UNESCO in this very important activity.

Jens Erik Fenstad: Opening remarks

Chair of COMEST

Dear Mr. Minister,
Dear Distinguished Friends,
Ladies and Gentlemen

First, I want to extend my thanks on behalf of COMEST to our Brazilian hosts for their kind invitation and for the great effort they have made to ensure the success of the Third General Meeting of COMEST. Thank you!

Next, I want to share with you some reflections on science and technology between freedom and responsibility - and the associated ethical and social problems.

The social contract

In the half-century after the Second World War there was an implicit social contract between society and science. Science emerged from the war with almost universal respect. This respect was turned into a belief in the ability of science and technology to solve or at least to contribute significantly to the solution of the major problems facing the nations. Science seemed worthy of this trust. The wealth of nations increased, medical research led to improved health, and the scientists were essential in building a security system in the cold war years. But welfare, health, and security are not without costs; the contribution of society to the social contract was a generous and long-term economic support of basic science.

The free conduct of science

In this situation the freedom in the conduct of science - across national and political boundaries - became a major concern of the community. Freedom of thought and enquiry is never easily won. General principles of freedom, which would also seem to ensure freedom in the conduct of science, had been set out in the United Nations *Declaration of Human Rights* in 1948. And freedom of enquiry seemed also to be guaranteed under the social contract, at least in some countries. In a very influential report, *Science: The endless Frontier*, which Vannevar Bush addressed to president Roosevelt after the war in 1945, we read:

Scientific progress on a broad form results from the free play of free intellects, working on subjects of their own choice, in the manner dictated by their curiosity.

Between freedom and responsibility

Renewing the social contract. The future of science is not what it used to be. The optimistic public perception that scientific insights and technological advances would provide a better future has suffered a severe setback. Such "benefits" of scientific progress as atomic power, new chemical compounds and foodstuffs produced by genetic manipulations now generate uncertainty, even fear, as to what the future holds in store for man and nature. How has this change come about?

In reviewing the social contract we noted that the postwar period was a good time for modern science-driven technology. The scientist had public trust. An increased awareness of environmental issues changed all this. Of the three elements of the old contract health remains a major concern. Welfare seems to have split into two parts, wealth creation on the one side and

meaningful employment on the other, the two parts not always being in harmony. The security element is the element that seems to have acquired a radical new meaning and is now to be understood in the sense of a protected environment, safe living conditions and future sustainability. In the postwar period few were troubled if at times scientists and engineers showed little concern for the preservation of nature - after all, the aim of technology has always been to transform nature for the benefits of humanity. There may, however, be limits to what nature can tolerate.

In her Presidential Address, *Entering the Century of the Environment: A New Social Contract for Science*, delivered to the American Association for the Advancement of science in 1997, Jane Lubchenco discussed the changed situation and the challenges ahead. She notes that science has been successful and that it had earned the freedom and trust it enjoyed under the old contract. But she forcefully argued that the "immediate and real challenges facing us have not been fully appreciated nor properly acknowledged by the community of scientists whose responsibility it is, and will be, to meet them".

Responsibility and the ethics of scientific knowledge and technology

In writing the new social contract between science and society we have seen a shift from *freedom* and *trust* to issues of *responsibility* and *accountability*. This in turn means a new emphasis on the ethics of science and technology.

There have been many responses to these challenges. A renewed ethics for science has several components, some internal to the scientific community and some dealing with the relationship to the larger public. The first component is to a large extent a question of accountability and codes of behavior. A recent survey by the ICSU *Standing Committee on Responsibility and Ethics of Science* (SCRES) noted 115 ethical standards or codes for science, 39 of them were international standards and 76 were national standards representing 23 countries on 6 continents. This will be the theme of a special session of this meeting.

At its 29th session in 1998 the General Conference of UNESCO decided to create a *World Commission on the Ethics of Scientific Knowledge and Technology* (COMEST). There were several reasons. UNESCO had already created a special bioethics committee, but the mandate of UNESCO reaches beyond bioethics alone. It was an obvious task for UNESCO to extend the mandate of the bioethics committee to the broader field of scientific knowledge and technology. We also noted above the many initiatives recorded by the ICSU ethics committee. But questions about responsibility and accountability of science to society are not matters of concern only to academies and scientific unions. A renewed trust in science needs a broader constituency. This is where the UNESCO World Commission enters the stage. The mandate is broad. The Commission should:

- serve as an intellectual forum for the exchange of ideas and experiences;
- detect on that basis early signs of risk situations;
- fulfill an advisory role for decision-makers in this respect;
- promote dialogue between scientific communities, decision-makers and the public at large.

The mandate expresses a concern with ethical reflections and discourse. The argumentative approach does not mean that theory and general principles are irrelevant; they are necessary guidelines in any ethical discourse. The emphasis was, however, on concrete issues and situations. COMEST has in the first round decided to focus on four themes: the ethics of fresh water resources, the ethics of energy, the ethics of the information society, and the ethics of outer space. Let me, very briefly, report on some of the

activities. Later sessions at this meeting will discuss these topics in more depth.

In the ethics of fresh water resources COMEST has established a world-wide *Research and Ethical Network Embracing Water* (RENEW) in close cooperation with the International Hydrological Programme (IHP) to promote engagement and best practice in the ethical issues involved in the sustainable use and equitable sharing of fresh water resources at all levels and in the handling of water-related emergencies.

In the ethics of outer space COMEST has entered into a close cooperation with the UN *Committee on the Peaceful Uses of Outer Space* (COPUOS) to promote ethical principles for the safe and peaceful use and exploration of present and future human activities in outer space. This work has identified a number of value issues that has not yet be covered by international law. COMEST will implement the joint outcome of this study in close cooperation with national space agencies as well as with international organisations such as IAF (International Astronautical Federation) and COSPAR (the ICSU Committee on Space Research).

As a follow-up to the UN *World Summit on Sustainable Development* (WSSD) in Johannesburg in 2002, COMEST will in the future concentrate on the ethical issues of sustainability, in particular, how to argue about value issues in complex environmental situations. A first step in this direction will be a joint study with ICSU on the Precautionary Principle. This principle and its application are currently the object of some controversy with different views taken in various parts of the world. There is a need for a careful and independent analysis to gain a better understanding of the principle itself and how it should be properly applied. The principle has potential implications for national and international environmental and health policies as well as for world trade. It is therefore important that the "principle" can be sharpened to be more than a rhetorical figure.

Responsibility and the individual scientist

The *World Conference on Science* organized by UNESCO and ICSU took place in Budapest in June 1999. In the *Framework for Action* there is a special section on ethical issues. In paragraph 71 of that section we read:

"Ethics and responsibility of science should be an integral part of the education and training of all scientists. It is important to instill in students a positive attitude towards reflection, alertness and awareness of the ethical dilemmas they may encounter in their professional life. Young scientists should be appropriately encouraged to respect and adhere to the basic ethical principles and responsibilities of science. UNESCO's World Commission on the Ethics of Scientific Knowledge and Technology (COMEST), in cooperation with ICSU's Standing Committee on Responsibility and Ethics of Science (SCRES), have a special responsibility to follow up on this issue."

This work is going forward. COMEST established a working group to give the necessary advice on how to integrate an awareness of and competence in ethics and the responsibility of science in the training of every young scientists. This work will be discussed in a special session at this meeting.

A concluding remark

Science needs to rebuild trust. There is an urgent need for openness and dialogue on the complex issues facing science and society. In a recent book, Academic Duty, the former president of Stanford University, Donald Kennedy, points to a certain imbalance or lack of awareness in the scientific community. Freedom is a widely shared value. But freedom has a counterpart, duty, which means an acceptance of individual responsibility. Everyone - scientist or not - has a duty to see his or her activity in a broader social and ethical context. If this sense of duty is not translated into

responsible action, freedom will be replaced by accountability, rules and regulations.

Eduardo Portella: Between science and the humanities

Every time we discuss the current status of science, or try to assess the impacts of technological development, we are also considering the future of man's humanity. To the extent, of course, that the mortgaged future we are facing still includes that endangered protagonist who answers to the name of man. The balance sheet before us now, less numerical than historical — if we agree that history has not in fact completed its lifecycle, as some hurriedly presume —, has certainly seen more trusting, optimistic, days. Our sense of alarm rises as time goes by and we take stock of our losses: loss of paradise, of illusions, of certainties and now, of employment.

It is unfair and irrelevant to insist upon the inhuman character of science, forged in the bunkers of an abstract humanism. What we risk is that potential wrong turn, when technical-economic-bureaucratic models let the means do away with the ends and erase the fine line between what is emerging and what is in excess. When all that we need is to open the way for socio-historical agents of human self-determination.

Nervous systems descended from prolonged authoritarianisms and propped-up populisms remain connected to artificial respiration devices. And they will continue to work at a loss as long as we lack a normative-judicial system that is able to give deliberative backing to civil society or, if you prefer, to civic participation.

There is clearly no way out unless the human is allowed by science to remain human and in turn allows science continue to thrive.

The philosopher Jean-Paul Sartre once remarked that man "is a useless passion". A statement we may be compelled today to reverse in no less emphatic terms: man is a passionless usefulness.

We all know that humans are ethical animals facing threats from every side: the dissolution of constitutive values, the reversal of modern indicators, the progressive destitution of the ecosystem, the dismembering of entire sets of moral references and codes. The ensuing socio-cultural unrest is reflected in the moral conscience. A scene completed by acute cases of social inequity and intellectual anorexia. Karl-Otto Apel is right when he warns that "Man's situation today is an ethical problem for the human being".

Science progresses in response to human aspirations that continue to rise as history unfolds. Even when doubts proliferate, and even when the self-same question haunts each step forward: what will remain of man if technological controls are indiscriminately accelerated? We know better than to settle for a nostalgic rejection of technique in the name of an increasingly sedentary humanism — just as we know better than to accept this sort of humanism's rigid philanthropic spin-offs, suffused with great intentions and nothing to show for them.

Modern reason quickly merged with instrumental reason. But today's hardening of man's protective shell is far from ensuring the desired tranquility. It appears more sensible to bring reason to more unprejudiced uses -- such that it might even permeate the symbolic and religious spheres.

It is not a matter of seeking a definitive moral cure, but of pursuing the healthiest ethical therapy, the highest degrees of forward-looking immunities. In this, there is no overestimating the potential dangers of science – nor, for that matter,

those of ethics. Especially when the former are domineering and the latter have no time for questioning.

Our intention here is not to repeat the Frankfurter pessimism in the wake of what some called the "eclipse of reason", but only to ask: to what extent do the discoveries relating to molecular genetics, biotechnology and informatics reduce or remove responsibility from the human project? More than a few have concluded, beyond a shadow of a doubt, that precisely from now on, man will take command over his destiny. He will be master and proprietor of his heredity. The concrete support of this heritage was already spelled out in DNA. But now it can be piloted in advance. Such is the programme led without hesitation by a market eugenism that closes its eyes to every one of its dysfunctional impacts on the human plane. It is clear that, in such cases, we cannot expect protective measures to emerge from an alarm system that is ready to go off at any moment.

I don't know if science, in its congenital voracity, is able to hear the voice of its « other ». At any rate, it needs the critique of culture to enlarge its horizon of legitimacy and to denounce the symbolic reification of the world of life, which is implemented through callous systemic determinations. We seem to have opted for the most comfortable way out — albeit at the expense of "exterminating the future", ironically using the pretext of anticipating and protecting our "tomorrows". Hence our disquiet as we see the post–human rear its head, encouraged by the technical control of what had been history. A frenetic race that can only be contained and re-directed by ethical will.

Many of us doubt that we can place our trust in the hands of the future, especially since the idea of progress has long ago overcome the idea of future and imposed its own rigid agenda. In the same vein, in its characteristically nearsighted fashion, the idea of development has abandoned its very own sense of enhancement and happiness to the notions of accumulation and profit -- and hardly a concern for man, earth, air, water, and so on. Science is not exempt from responsibility in this complacent dilapidation. From the time of positivism, when the determination of progress became the "mot d'ordre", the logic of "scientification" started to demand full time dedication from all its contemporaries. There was little the arts could do under these circumstances of rudimentary inflexibility. We were slow to realize that what we were nourishing were but the first stirrings of a belligerent logic. The triumphant posture inherent to the metaphysics of progress replaced the ancient legend of humanity's constant stride ahead.

We can already recognize the place of ethics in the technological civilization, the *Responsibility Principle* of which Hans Jonas spoke to us. But could ethics be the answer if it is not in question? In all likelihood, were it able to overcome the solitary and isolationist conscience, I would say yes: if it is never given in advance, contemplative or prescriptive, but always shared, dialogical, reconsolidated in and in consonance with our deeds and endeavors. Such an ethos is particularly fertile in times of reconstruction. It would not exactly be a "minimalist ethics" inspired in "moral prescriptions". Above all, it would exist in a pact with science, as a nucleus of reconstruction, a site of re-acquaintance and reconciliation between science and the humanities.

The new encounter of science with ethics, in a relationship of shared responsibility, can augur a new era in the lives of peoples who are emancipated or in a process of emancipation. From hence can arise a culture that demands and respects the human right of the "other", forged through freely consensual alliances, ethical and inter-ethnic contracts. The sciences now developed in our impoverished universities have a significant role to play in the building and rebuilding of the history that is just beginning.

Dagfinn Føllesdal: The teaching of ethics

1. Background

There is a growing demand for ethics in science and applications of science and also in all sectors of society. In most countries there is also a readiness to strengthen the teaching of ethics at all levels from elementary school to Ph.D. programs. UNESCO took an initiative to introduce ethics into the training of scientists in 1999, at the World Conference on Science and the use of scientific knowledge held by UNESCO and the International Council of Scientific Unions (ICSU). In the Declaration of Science made at this conference, section 41, it is stated:

All scientists should commit themselves to high ethical standards, and a code of ethics based on relevant norms enshrined in international human rights should be established for scientific professions. The social responsibility of scientist requires that they maintain high standards of scientific integrity and quality, control, share their knowledge, communicate with the public and educate the younger generation. Political authorities should respect such action by scientists. Science curricula should include science ethics, as well as training in the history and philosophy of science and its cultural impact. (UNESCO 1999).

The plan of action from this same conference, "Science Agenda - A Framework for Action," states in point 71:

Ethics and responsibility of science should be an integral part of the education and training of all scientists. It is important to instill in students a positive attitude towards reflection, alertness and awareness of the ethical dilemmas they may encounter in their professional life. Young scientists should be appropriately encouraged to respect and adhere to the basic ethical principles and responsibility of science. (UNESCO 1999).

Also at the world conference on sustainable development in Johannesburg last year, the world leaders reaffirmed the need of education for sustainable development. UNESCO was designed as the lead agency for promotion of the Decade of Education for Sustainable Development starting in 2005 (United Nations 2002).

UNESCO's World Commission on the Ethics of Scientific Knowledge and Technology (COMEST) has committed itself to put this declaration in action. The recommendations for the teaching of ethics for scientists in the report that our committee has submitted to COMEST are a step in this direction.

2. The need for developing competence in ethics

Many of the most important ethical predicaments the world community is facing today arise in connection with science, in scientific research, and in the development and applications of new technology, notably biotechnology.

When we are faced with these challenges, one main thing to do is to develop competence in ethics and use it to deal with the issues that face us. Ethics is itself a field of research study, one of the first fields where mankind attempted to gain insight through disciplined thought. This study has never been more intensive than now. As in other fields of scholarship, if one neglects what has been done, one is likely to repeat errors and mistakes and propound views that have been

thoroughly studied and found to be inadequate and lacking.

One common error is to think that the rightness or wrongness of an act is proportional to the strength of our feelings when we contemplate the act. A brief reflection makes us aware that this is not so. For example, if we read a notice in the newspaper telling that one hundred children in Africa have starved to death, we will probably pause for a while and think "How sad," before we turn the page to the sports section. If the report is illustrated with pictures of the starving children, we will probably feel sadder, and if we watch the news on live TV, strong feelings might develop in us. If we are in Africa with the children, we will be even more powerfully affected by what happens. If we have come to know some of the children and formed emotional ties with them, we would probably be overwhelmed by grief and certainly have done all we could to help them. And were they our own children, our agony would know no limit.

These are well-known phenomena that have been studied by psychologists and by moral philosophers. David Hume, in his *Treatise of Human Nature* (1739), discussed the phenomenon (though with other examples), and its implications for ethics. A key issue of ethics, also today, is how we can find out what is right or wrong when the strength of our feelings is no reliable guide. Particularly in modern science, where one is carrying out experiments in a laboratory and where what happens in test tubes seldom gives rise to strong moral feelings, systematic reflection on moral issues becomes a must.

We all know, at least vaguely, what it is to know a scientific field, like nuclear chemistry, biotechnology or law. But what is it to know ethics? What have ethicists learned through their training? One thing that ethicists do learn, if they get a proper training, is argumentation, that is, to offer a set of reasons or evidence in support of a conclusion. An argument is supposed to provide evidence, give us reasons to believe. We could emphasize this by talking about '*rational* arguments'. An argument is hence not just a set of statements that are designed to sway an opponent. Advertising and rhetoric do not qualify as arguments in this sense. Nor would a series of statements that starts from beliefs that the opponents do not share be the kind of arguments one wants. In such cases, the beliefs from which one starts must themselves be supported by arguments until one reaches common ground. To distinguish good arguments from bad ones, and to be able to construct good arguments, is something one must learn. It is of crucial importance for fruitful discussions and learning this should also be a main aim of the teaching of ethics to scientists.

3. Why arguments?

Here are three arguments for the emphasis on arguments:

First: arguments are a way of finding out *which views are better* than others. One main theme in moral philosophy, as in science, is to clarify why and how arguments can help us sort the good views from the bad ones.

Secondly: arguments *stimulate inquiry*. In arguing for or against an issue, we discover that various factors are relevant for the issue, factors that we had not thought about and that it may become crucial to explore. For example: who is affected by what we are about to do, in what ways, with what probabilities, with what information, with what freedom to decide, and so on.

Thirdly: arguments demonstrate *respect for the other*. We approach the other as an autonomous human being, capable of making up his or her own mind, not as an entity to be manipulated by rhetorical devises, appeal to authority or other strategies. These other strategies come in many varieties. They may be appeal to religion, appeal to the strength of one's feelings, to traditional ways of dealing with the issues, to what the majority

regards as right, how it is dealt with in other places or other countries, etc.

Emphasis on arguments is important not just out of consideration for the autonomy of the other. It is also an important part of social ethics. Emphasizing arguments will make life more difficult for political leaders and fanatics who spread messages which do not stand up to critical scrutiny, but which nevertheless often have the capacity to seduce the masses into intolerance and violence. Rational argument and rational dialogue are of the outmost importance for a well-functioning democracy. To educate people in these activities is an important part of all teaching, and in particular the teaching of ethics.

4. The teaching of ethics

In view of the above, the central aim of the teaching of ethics should be to develop the students' ability to recognize and analyse ethical issues in order to be able to reach decisions on how to act ethically. This comprises several partial aims:

- the study should increase the students' awareness of ethical issues
- provide a deeper understanding of ethical matters and greater clarity in ethical questions
- place ethical problems in a wider context and make explicit the alternatives that we may choose from, and how their various positive and negative consequences are experienced by those who are affected
- develop the skill for ethical analysis and argumentation
- determine areas where social practice or legislation is at odds with ethical standpoints which seem to be well-founded

As for the first of these points, it is important that the ethics courses are open to cultural and traditional differences. There are great regional differences concerning what are viewed as the most actual ethical problems. The challenges are also quite different in poor and rich countries. Religious differences as well will affect the way ethical dilemmas are viewed and reflected on in different places. It is, however, also important to locate issues that ought to be reflected on and discussed, but which are so deeply ingrained in a culture that they tend to go unnoticed.

For students working in other cultures than their own, for example in connection with fieldwork, it is crucial to be aware of regional differences. In the students' later professional work it is important to keep these differences in mind. Different countries and different regions often face different ethical problems. Regional differences in the urgency of different ethical problems and in ways of dealing with them should be taken into account in courses held in different parts of the world.

For the developing countries it is particularly important to build up competence in ethics. These countries are exploited in so many ways, through unfair trade agreements, bad treatment of workers, takeover of natural resources, land, water, etc., patenting of biological material or of insights based on traditional knowledge, introduction of plants or cultivation methods that destroy traditional life styles and cultures, and also tests on new drugs under conditions that are illegal in most developed countries. The examples can be multiplied, but they show that the developing countries stand the most to gain by building up ethical competence, preferably combined with competence in other fields.

5. Double competence and qualifying courses

In view of our experience in Norway, where the National Research Council has sponsored a ten year program in ethics that has just come to an end, I would strongly recommend that the teaching of ethics for scientists should emphasize two features: It should aim at building up *double competence* and it should make use of a broad range

of *qualifying courses* which familiarize the students with the main issues in ethics.

Double competence

In order to deal adequately with ethical issues in a certain area, one has to be thoroughly familiar with the area. Otherwise, one will not have enough information to judge the possible alternatives and the probabilities of the various consequences that are crucial for the ethical discussion. One also has to know ethics well enough to be aware of crucial distinctions and considerations that make the difference between good and bad arguments. Without such double competence scientists tend to think that ethics is a matter of expressing one's convictions, and ethicists tend to know too little about the alternatives that are available and their various consequences.

The program we had in Norway therefore offered scholarships for the study of ethics to people who already had a Ph.D. or equivalent research competence in a scientific field. One preferred applicants who were doing very well in their scientific field and could be expected to make a career in that field, and one avoided people who had not succeeded in getting a job in their own field and now were searching for something else to do.

The program received very many and very good applicants from various areas of natural science, social science and humanities, including economics, law and education. The best ones were offered one year qualifying scholarships to take courses in ethics. On the basis of the work they did in these courses a selected few were then offered three year fellowships in order to write a dissertation.

One often encounters the view that a good scientist can pick up the ethics he or she needs very quickly. However, our experience in the ethics program was different. Again and again our research fellows, who often are among the best researchers in their field found that they needed more time for their ethics dissertation than they needed for their science dissertation. The four year fellowship support that is given by the ethics program often turns out to be a little short

By insisting that those who work in applied ethics should have a double competence, the Ethics Program sought to create a good basis for an enlightened discussion of the complex issues that are so crucial to our future.

Qualifying courses

The second distinctive feature of the Ethics Program was the qualifying part, which consisted of research courses at the highest international level. Five such courses were arranged per year, and the instructors were among the top people internationally in their respective fields. The quality of the instructors and of the courses they taught is a most important means for securing the quality of a program.

The qualifying courses normally lasted one week (10-12 two-hour lectures over 5-6 days). Two to three months before the beginning of the course the participants were provided with a literature package consisting of 500-1000 pages of articles and books which they were expected to have read before the course began. A most important part of the course program was that after the course the participants had to write an essay that was read and graded by the lecturer. Participants were encouraged to rewrite their essays in view of the lecturers' comments and submit them for a second round of comments. In Norway, at least, university students write far too little. The overall work-load for one course was estimated to about 6 weeks of full-time work.

The courses were primarily meant to give the grantees of the program the broad and deep competence in ethics that they needed in order to carry out research in this field. Those participants who did very good work in the courses were

offered three-year scholarships to work on a dissertation. The work the participants did in their courses, and in particular their essays, gave the Ethics Program a very good basis for deciding which of the researchers should be given three-year dissertation fellowships. However, the courses were also highly relevant for other groups, such as, for example, external research fellows and researchers and professionals from various fields, including many members of the various Norwegian ethics committees. Also, many research fellows continued to follow courses even after they had completed their qualifying year in order to further develop their competence within those areas of ethics which are of special relevance to their projects.

The courses thereby served several important functions. They did not only prepare for research in ethics and help the program to recruit and select fellows that are given three additional years of support by the program, but they also built national competence more generally. Most of the courses were held at Norway's four national universities, and the participants, usually between 20 and 30 for each course, came from all parts of the country. More than 500 people participated in the courses, and most of them took several courses. The courses thereby contribute to developing a countrywide "ethics network" crossing disciplinary boundaries and with close ties to international research. The network was sustained through an ethics newsletter and electronic bulletins.

6. Advising, colloquia, and annual gatherings

The fellows who went on to write dissertations were followed up by intensive and competent advising, colloquia, and annual gatherings for all fellows and advisers.

The only control of quality in an international field like ethics is to publish in the best international journals, that is, those that reach and are read by those who make the main contributions to the field. For this reason, the fellows were required to write their dissertations and research articles in a major international language.

The program has also sought to reach the general public and take up practical issues. The research fellows who have been supported by the program were required to present their contributions to a broader public, in newspaper articles and public lectures. The program also aimed at stimulating the discussion of current ethical dilemmas and thereby to assist in clarifying alternatives and improving the basic for decision-making on different levels and in different areas of social life.

I strongly recommend that ethics be taught in such courses where the students are not just listening to lectures, but get ample opportunity to write essays that should be read and commented upon by a teacher who is thoroughly familiar with the issues. Discussion groups and conferences should not take the place of a thorough systematic introduction to ethics. They may be a supplement to systematic teaching, but they cannot replace it.

It is important that the teaching be tied to concrete examples from the students' fields, preferably examples that the students find difficult and which therefore motivate them to careful analysis and independent reasoning. Often it motivates students to start with such examples and work one's way into the ethical analysis.

7. Levels of teaching

There is need for teaching at three levels:

1. Elementary ethics courses that all students ought to take

It is desirable that all science students get some basic knowledge of ethics. We therefore recommend that all students get at least one course of ethics. Even in such an elementary

course it is important that all main factors that go into the evaluation of the rightness or wrongness of a course of action be touched on. There will be no time to go into depth on all of these, but it is important that the students learn not to neglect factors that in many cases can be quite important for making the right decision.

2. More advanced courses that are part of the PhD requirements in the various sciences

In connection with the work on their Ph.D. dissertation students should consider carefully the ethical issues that are raised in the dissertation, both the internal problems of research ethics and the external problems that arise in connection with the likely applications of the results reached in the dissertation. They should also consider other ethical issues that they are likely to encounter in their later professional life.

3. Courses that lead to a Ph.D. in ethics, suitable for teachers of ethics for scientists

Teaching ethics for scientists requires not only a solid competence in ethics but also a thorough knowledge of the science whose ethics is being discussed. Much can be achieved by co-teaching, where a scientist and an ethicist teach together. Within scientific research much can be gained by having ethicists work as members of research team. Most scientific research projects cannot be worked out by a single individual; they require a team of researchers and a stimulating environment. It is perfectly feasible that ethicists could be members of research teams in chemistry, or in computer science, etc. In Switzerland a group of biologists working on human stem cells declared that their project was funded by federal institutions because they had worked with a philosopher, and because the ethical argument was included in the protocol they submitted for funding. However, this kind of teamwork requires that the members of the team communicate well, and that in turn presupposes some basic knowledge of one another's fields. It is highly desirable, both for teaching and for research on the ethical issues in a certain field of science to have at least some people with a solid double competence of the kind that I just described, people who combine research competence in the scientific field in question with research competence in ethics.

8. Quality

Quality work in ethics, as in other scientific and scholarly fields, consists in the generation of new ideas that are well supported and argued for, and the main measures of quality are publications that reach the foremost researchers in the field and are made use of and quoted by them. This requires articles in journals that are likely to be read by them and books published by publishers with wide distribution in the scholarly community.

Teachers and students of ethics should therefore publish at least some of their work in such a manner that they reach the foremost researchers in the field. This requires publication in a language that these researchers can read. In addition, one should, of course, encourage publications, seminars and lectures that reach a wider audience. Thus, for example, one may make it a requirement for a Ph.D. that in addition to a thesis, the candidate publish a popular presentation of some of her/his work.

Ethics is of concern to all. We all have our views on ethical issues, and we express them. This does, however, not qualify us to teach ethics. Teaching of ethics does not consist in imparting to others our ethical views, but in enabling others to take their independent stand on ethical issues. This requires a thorough and broad competence in ethical theories and ethical argumentation. It is the duty of people in charge of teaching programs in ethics to see to it that the teachers have such qualifications.

9. Developing countries

Many countries do not presently have people with the kind of qualifications in ethics that just were outlined. This holds for many rich countries as well as for developing nations. Rich countries can meet this challenge by establishing programs to build up competence in ethics, as Norway has done, and use top ethicists from other parts of the world to teach in these programs.

Developing countries would need support from abroad to develop such competence, either by establishing ethics programs of their own or by sending students to good Ph.D. programs abroad. In many developing countries there is a lack of qualified teachers and dynamic materials for the ethical programs, and the researchers and teachers in ethics have little opportunity to participate into international conferences and/or training courses to further their skill and update their knowledge. It is a challenge for UNESCO and other international organizations to provide the economic means for such solutions, as a timely help to improve the ethics teaching in these countries.

Zbigniew Szawarski: Moral uncertainty and teaching ethics

Facts

We belong to the same species of *Homo sapiens* and have common biological needs. Yet we do differ with regard to our individual wants, desires, drives, and interest. Although our moral behavior and system of values are usually a reflection of our culture, our individual needs, wants, desires, and interests never form a fully rational and coherent system. People want or desire too many different things at the same time and usually their needs and desires are in conflict. There are many reasons that make this conflict inevitable. Our natural resources are limited and they are being used up at an alarming rate. So far we have enough clean air to breath, but soon drinkable water may be a problem, not to mention some other not recyclable resources. Our information about the world and its values is equally limited and often unreliable. Even if we can choose rationally the best possible means to achieve some goals, we still do not have a rational and trustworthy procedure to decide what should we really strive to do. People differ dramatically with regard to their intelligence and knowledge, and even if we decide rationally to implement some policy it soon turns out that there are some other reasons that make us incapable of accomplishing our goals. Very few people disagree that peace is a universal and morally desirable value, but there is not a single day without war or a local conflict taking place. People also differ with regard to their sympathies, inclinations, and the way they think about and treat other people. Racism, nationalism, terrorism, fanaticism, or just blind hatred are common facts of everyday life.

Values

If we assume that all what we need or all that we care about has a certain value, then it is evident that there are many kinds of values and that they are not simultaneously attainable. Therefore, the first and the most important question of ethics is the question "What are the things I should care about?" and then "What shall I do or what shall we do in this particular situation?". It is natural that we normally deliberate on our sense of life and it is equally natural that there are situations in which we are not certain what should we do in this particular situation. And because the same questions may bring different answers it is evident that two societies may strive to accomplish two dramatically different and incompatible ideals of life, or an individual person may be totally lost in moral deliberation and despair when the alternative and necessary ways of action seem do be equally wrong. Moral uncertainty and moral conflict are then unavoidable.

The nature of values

There is no universally accepted theory of values and philosophers permanently argue about the nature of values. Nevertheless there are four theses that seem to be particularly relevant in this context.

There are some basic or universal values, and there are some particular or secondary values. If we as a species have the same biological nature, then it seems quite plausible that we value the same things. Therefore it is tempting to talk about some basic moral norms, goods and evils. Feeding a hungry child is always the right thing to do. Harming a child is always evil. On the other hand, because

people live in dramatically different natural environments with their local cultural traditions, we can observe striking differences in their ways of life. So even if we consent that there seem to be some basic or universal moral values, we still have a problem how to precisely distinguish what is the basic and what is the secondary value.

There are moral and non-moral values. Again although this seems to be evident, there are not any clear criteria to make a fine distinction between the two sets of values. We have no doubts however that such values like justice, happiness, love, virtue, or suffering belong to the realm of moral values. On the other hand such values such as knowledge, power, wealth, efficiency, quality, or beauty belong to another realm.

T*wo values are incompatible,* when they cannot be fully attained at the same time. It is impossible to have a perfectly safe and perfectly free society at the same time. If we want to be both safe and free, we must accept some compromise solution and the problem is what are the limits of compromise and how it should be achieved.

There are commensurable and incommensurable values. It is possible to weigh and measure the quality or the quantity of things. However it is difficult and some philosophers claim it is impossible to compare and measure moral values. What is more important or valuable e.g.– life or freedom, life or dignity? Therefore, it is sensible to try to discover or to establish some order or the rules of preference in deciding what should we choose in a particular situation. This is the task of ethics.

Ethics

Human agents and their actions are subjects of moral judgment. Ethics assumes that we are rational agents and that free and rational choice is the necessary condition of moral responsibility. To be a moral agent means to be a person who is able to be morally responsible for her actions. However, the fundamental problem of ethics is how do we know what is good and right? How is it possible, or is it possible at all, to refer to reason in making our moral decisions. Traditionally we used to look for the answer in our moral tradition or religious faith. Today we are perfectly aware that there are different moral, religious, or ideological traditions and some philosophers and scientists profess the idea of the clash of civilizations. The idea of moral relativity has become one of the leading topics of modern ethics. But even if it is true that all values and moral rules are culture-related, does it really mean that there is no moral knowledge?

The idea of moral knowledge

Some people claim that they know what is good and evil and how should we live and sort out our practical moral problems. And there are moral philosophers who challenge and reject such a strong claim. It has been common to describe these two fundamental approaches to ethics using two terms – moral cognitivism, and moral non-cognitivism. If you are a moral cognititivist, you know that there is a sort of objective moral reality, moral facts, or objective moral values and it is possible for the human agent to discover and hold the moral truth. If you are a moral non-cognitivist you reject the idea of any objective moral values, or you tend to perceive moral conflicts and disagreements as a clash of conflicting attitudes, moral principles, or ideals. Although there is no moral truth, nevertheless it is still possible to devise some methods of selecting and justifying our moral beliefs. The same idea can be expressed using a slightly different terminology of moral monism and moral pluralism. We ask then whether it is possible to discover some moral order in the world or what is the fundamental moral value or the principle that we may refer to in making our moral choices.

Moral monism. There is a rich variety of monistic theories but all of them have one common feature: they claim that there is always one and only one moral value, virtue, moral law, a system of rights, or a hierarchy of moral values that is ultimate and overriding. The value is overriding if

and only if (a) it always prevails in the conflict with any other values, and (b) the only permissible justification of its violation is the preserving of that very value. If we assume, as many people do, that human life is sacred, it means that in the conflict of life and any other value, we should always choose life. Thus, we should never legalize or even tolerate abortion and euthanasia. The right to life is always more important than the right to free choice or moral autonomy. On the other hand it may be quite right to accept capital punishment or killing in the just war. Whatever system we accept, be it natural law ethics, Kant's categorical imperative, or the principle of utility, we shall always have the problem how to explain and justify the source of our knowledge – is it Divine revelation, intuition, reason, or experience? The idea of moral knowledge presupposes that there are some moral experts who see better than others what is the objective moral order and what to do in the situation of moral uncertainty and conflict.

Moral pluralism. It is a relatively new approach, although it has quite famous predecessors to mention only some great names like Aristotle, Montaigne, or Hume. Today it is mostly represented by philosophers like I.Berlin, J.Rawls, B.Williams, Ch. Taylor, or T.Nagel. Moral pluralism is an ideal moral philosophy for modern liberal democracies as it holds that people may have different ideals of good life and that particular ideals of good life do not need contain any common overriding value. People are free to choose whatever ideal of the good life they wish provided they respect some fundamental moral rights of other people. There is no permanent and fixed moral order. We are immersed in the universe of free-floating values, which may clash and conflict with each other. Moral conflict is inevitable and moral uncertainty is a natural feature of our human condition. As all values are conditional and all moral duties and obligations are *prima facie* only, it is always possible that in a particular situation we should value life more that freedom. On the other hand, it is equally possible that in another situation freedom becomes more important than life and should override life. Because values are not homogenous and cannot be reduced to any common denominator we have no other choice as permanent debate and negotiation concerning the best possible moral solution or a policy. Thomas Nagel who is particularly sharp in his diagnosis of our moral predicament suggest in his essay *The Fragmentation of Values* the following list of five fundamental types of value that give rise to basic moral conflicts. These are: specific obligations to other people or institutions, constraints on action derived from general right everybody has, utility, i.e. harmful or beneficial consequences of our actions, perfectionists ends or values like scientific discovery, or artistic creation, and last but not least the commitment to one's own projects and undertakings. If this is the case it is not clear how we as a society should organize our moral life or how should we rationally make our personal decision or what should we expect from a moral theory. There are some modern ethical theories that seem to provide a method of how to deal with moral conflicts and uncertainties, to mention e.g. R.M.Hare's universal prescriptivism, R.B. Brandt's Ideal Observer's theory or J. Rawls's idea or the wide reflective equilibrium. On the other hand, there are philosophers like T.Nagel, or W. Williams who doubt if ethics can provide any definitive rational decision-making procedure. Whatever moral philosophers say and argue about, the practical issue now how is it possible now to teach ethics.

Teaching ethics

If we really *know* how things are in the realm of moral values, if we really know what is right, what is good, and what are our moral obligation, then teaching ethics is simply passing on the moral knowledge the same way we teach English, physics, or math. However, if there is no moral knowledge, because the language of morals and the way we justify our moral beliefs differ dramatically from the language of science and the way we establish and justify our beliefs in science, then we have a serious problem. How can I teach

ethics if I question or reject the idea of moral knowledge? If we assume that there are three distinctive streams of ethical deliberation – i.e. descriptive ethics, moral philosophy, and normative ethics, then it is relatively easy to teach ethics as a social science of morals. What we can do then is to explain to our students what is morality as a psychological or social phenomenon, how it originated, what are its determinants, or how it can be explained using the methods of science. We can add to this enterprise the history of ethics. It is also relatively easy to teach moral philosophy when it is understood as a second order analysis on the fundamental concepts, principles, methods of reasoning and presuppositions of ethics. What I find particularly difficult and contentious is teaching ethics as a sort of normative system. If we reject the idea of moral indoctrination and we want to rely on reason and the personal responsibility for one's moral choices only, then, I think, we must explain to our students why is it so difficult to find *the* proper method of reaching moral decisions in ethics. Perhaps we have to teach our students some basic facts about the nature of values and the way we think or should think and rationally argue about moral issues. Teaching ethics is then identical with teaching some basic skills in the rational decision-making.

Teaching ethics in the totalitarian tradition

The moral monism is the typical way of moral deliberation in Central and Eastern Europe. People tend to assume that whatever moral position they take, they must refer at the end to some ultimate moral authority as a trump card. It does matter if it is a religious authority (in Poland it is usually the Pope), or the secular one (in the communist tradition – the party or its leader). What really counts is having *the* moral truth. Therefore, instead of friendly and rational argument we usually have an aggressive and hostile clash of attitudes. The post-communist society consists mostly of people who as a rule do not recognize the idea and the value of moral pluralism as a necessary condition of modern democratic society. We are not a culture of a moral compromise and we are not certain how to learn it. We are inclined to think that we should not tolerate people who have false moral ideas. Thus, if we are to teach ethics in this part of the world, perhaps it is sensible if we assume a sort of Rawlsian veil of moral ignorance and admit – at least for the sake of argument – that although there is no objective system of moral values, nevertheless as a society we must a find some compromise and optimal solution of our moral problems. It may be sensible then if we take as a starting point the idea that there are no moral truths and no moral experts. „Few things – said I. Berlin - have done more harm than the belief on the part of individuals or groups (or tribes or states or nations or churches) that he or she or they are in *sole* possession of the truth: especially about how to live, what to be and do— and that those who differ from them are not merely mistaken, but wicked or mad: and need restraining or suppressing. It is a terrible and dangerous arrogance to believe that you alone are right: have a magical eye which sees *the* truth: and that others cannot be right if they disagree". [Berlin I, *Notes on Prejudice*, New York Review of Books, Oct. 18, 2001.]

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Ana Borovecki: "Health, Human Rights and Ethics" curriculum – a short overview

The master program "Health, Human Rights and Ethics" at Andrija Štampar School of Public Health presents an important contribution to the ethics education in Central and Southeast Europe. The program will offer a theoretical and practical immersion into health care ethics, paying particular attention to European philosophical and spiritual traditions, especially in the Central European and SEE region, focusing on the special problems characteristic for transitional societies.

The master programme in 'Health, Human Rights and Ethics' will be organised by the Andrija Štampar School of Public Health, University of Zagreb, Croatia, with the assistance of professionals in health care, law and bio-ethics from Europe and the US.

The programme will be supervised by an international Programme Committee. This Committee will liaise the new master programme with the curriculum of the Medical School and the University of Zagreb. The Committee will be responsible for the quality and evaluation of the teaching activities. The program has been designed according to European Credit Transfer System.

Aims of the programme

The master programme in 'Health, Human Rights and Ethics' has the following aims:

1. To enhance the moral sensitivity of students
    a. to make students aware of the normative dimensions of health-related decisions, so that
        i. they are able to identify which aspects of decisions are technical in nature and which are ethical,
        ii. they are able to assess how technical and ethical aspects are related to each other
    b. to develop skills in analysing the normative dimensions of health-related decisions (identifying moral principles and rules; critically analysing moral arguments)
2. To develop skills in exploring and justifying personal decisions regarding ethical issues as they arise in specific health care contexts
3. To understand the ethical and legal principles and values which underpin good care for health
4. To reflect critically about the most salient ethical issues in today's care for health (scientific research, environmental health, health policy, professional relationships, health institutions, genetics and reproduction, end-of-life care, health promotion)
5. To provide knowledge and understanding of the interrelations of public health and ethics.
6. To understand the basic concepts and values connected to human rights and their importance not only on the level of the healthcare but also on the global policy making level
7. To understand the ethical issues which arise particularly in the context of the countries in transition

Structure and content of the programme

The basic unit of the programme is the module. Each module generally requires one week teaching, and 2 weeks preparation. The total number of modules is seventeen. Of these modules, 16 each require 1 week of teaching in Zagreb. These 16 teaching weeks are concentrated in four residential months distributed over 2 consecutive years (4 times 4 modules distributed over the two years).

The modules will be as follows:

- Introduction into ethics
- Legal sources and regulatory frameworks
- Human rights, health and transition societies
- Health and scientific research
- Health and society
- Environmental ethics
- Health policy
- Ethics and health institutions
- Professional relationships
- Genetics, reproductive health and public health
- End-of-life care
- Health promotion and prevention
- Practical skills 1: Analysis of moral issues: writing and presenting a paper
- Practical skills 2: Analysis of research protocol or ethical guideline
- Practical skills 3: Engaging in public debate
- Practical skills 4: Teaching ethics
- Writing a scientific paper

The advantage of this format is that more time is allowed to the students for preparation. The programme can also intensify the learning process over a longer period; learning materials can be better incorporated in the student's experience; teachers will be more easily available if the teaching effort is spread over time; students will be better able to attend if they need only two months absence from regular work. The disadvantage is that students have to travel and be accommodated during 4 periods in Zagreb. Modules will not only provide theoretical teaching, but also a mixture of theory and practice; they will furthermore develop student's skills in analysing and resolving problems and will enhance their practical abilities in writing and presenting scientific work. They will also develop and train the teaching abilities of students, as well as their capacity to contribute to public debate.

Teaching and learning strategies

Each module will require extensive preparation by the students of materials and literature that will be provided in advance. This preparation will be done in the student's own environment. Once the teaching in Zagreb has started, the students will be immersed in an intensive education programme. The four modules focused on practical skills will require intensive self-activity of the students. They will also be trained in teaching ethics and in participating in public debate. Prior to the start of each module, the students will receive an information package including the syllabus of the programme, as well as reading materials and preparatory assignments. For each module, a comprehensive reader with literature will be available; this literature has to be studied in advance.

Student assessment and evaluation

At the close of each module, students will have to perform an examination; this usually will be a written examination with open questions testing whether the student has accomplished the objectives of the module. Students will also be evaluated on the basis of their presence and active participation in each course; they will have to make individual practical assignments, and make presentation in the modules.

All modules and teaching activities will be evaluated by the participating students. For these evaluations a written standard evaluation form will be used. An open and oral evaluation will also be performed in a closing session of each module.

By creating the "Health, Human Rights and Ethics" master program, the Andrija Štampar School of Public Health will introduce new developments into the field of ethical issues in health care and new challenges for education in the region of the Southeast Europe and other transitional societies.

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Table 1- Time schedule of the programme

First year –first residential month

Module	Introduction into ethics	Legal sources and regulatory frameworks	Human rights, health and transition societies	Practical skills 1: Analysis of moral issues: writing and presenting a paper
Teaching time	40 hrs	40 hrs	40 hrs	12 hrs
Preparatory time	80 hrs	80 hrs	80 hrs	48 hrs

First year – second residential month

Module	Health and scientific research	Health and society	Environmental ethics	Practical skills 2: Analysis of research protocol or ethical guideline
Teaching time	40 hrs	40 hrs	40 hrs	12 hrs
Preparatory time	80 hrs	80 hrs	80 hrs	48 hrs

Second year – first residential month

Module	Health policy	Professional relationships	Ethics and health institutions	Practical skills 3: Engaging in public debate
Teaching time	40 hrs	40 hrs	40 hrs	12 hrs
Preparatory time	80 hrs	80 hrs	80 hrs	48 hrs

Second year – second residential month

Module	Genetics, reproductive health and public health	End-of-life care	Health promotion and prevention	Practical skills 4: Teaching ethics
Teaching time	40 hrs	40 hrs	40 hrs	12 hrs
Preparatory time	80 hrs	80 hrs	80 hrs	48 hrs

Second year

Module	Writing a scientific paper
Teaching time	Through distance learning
Study time	120 hrs

Volnei Garrafa: Applied ethics in the context of the southern hemisphere

Introduction

The world is in the middle of a postmodern period, an incomplete expression that, just as a current worldly moment, it only means a timid epoch in the historical context of humanity. The two political models that during last century had proposed to sort out, or at least to reduce, the great difference amongst the rich and he poor nations of the planet failed. Communism bore in itself the downfall of the Berlin Wall as a symbol of its tangible failure. And Capitalism, spite of the fact of preserving its presence in the beginning of the 21st. century, has made its impotence dear when facing the growing abyss between the developed and underdeveloped regions, in the Northern and Southern Hemispheres of the world. What is concerning, above all, is the lack of political propositions that could transform the courses of the world into better ones.

Facing this emptiness, it is not correct to think of a construction of a new international network of morality, which would support necessary adaptations and deep changes in the contemporary world. Since Aristotle had expressed himself 24 centuries ago, saying that life is the highest good and that its main aim is the pursuit for happiness, nobody has yet been able to deny this statement conveniently. The human species is the one and only sense and goal to development. Because of all this and the above referred contradictions, there is no doubt about the need for distributive paradigm changes in the economic, scientific and technological fields, as mainly, of social commitments and responsibilities, what does not mean a dissolution of existing values, but its transformation.

Nevertheless, these transformations are difficult to be accomplished. The resulting moral of modernization has not been able to articulate the modern agenda of autonomy together with the ideal of Aristotelian happiness. The alliance amongst science, technology and economics in a context of political liberalism and capitalism has brought progress, development, wealth and political liberty to part of the world only, thus generating poverty, underdevelopment and inequality to the majority of the population (SASS, 1991). From this somber diagnosis, an ethical concern was born the one that morals dependant on strategic-instrumental rationality, on decision making, on subjective irrationality or of pragmatism show itself incapable of facing challenges and grounding the basis of a macro-ethics of solidary responsibility (APEL, 1986; APEL, 1991).

Having as a reference the evidence of an undesirable indicator of social unbalance, which result in unsustainable ethical paradoxes, the pursuit of practical and ethical responses, based on appropriate theoretical references, has become a priority to poor countries. Beginning with the construction of a new critical and epistemological framework, dialectically engaged to the needs of the majority of the populations excluded from the developmental process, the dilemma – currently detected by peripheral specialists that work with the theme of ethics – should be faced more objectively. Philosophers and researchers in the Southern Hemisphere should not submit themselves to the increasing process of emptying and unpoliticising of moral conflicts, what excludes room for indignation. The ethical justification is distorted, serving as a

methodological neutral tool used exclusively for mere reading and the interpretation of problems, with no intervening proposition. The seriousness of different situations is softened or even annulled, mainly those that are collective and, thus, result in the most profound social distortions (Garrafa & Porto, 2003). However, an intense political and educational effort is necessary in order to promote real behavioral changes in individuals and peoples, these changes that should start at grade school, be ripened at high school, and be solidified at university level.

An epistemological statute for the Education of Ethics in the 21st century

With the profound social-historical transformations that took place during the 20th century, mainly because of armed conflicts and the accelerated scientific and technological development, "applied ethics" began to experience a growing recognition, even among philosophers, that previously had denied it. After the worldwide disillusion about the modern ideology of globalization and progress at all costs, instead of bettering civilization living conditions, it has yet deepened the imbalance among citizens of the central countries and those of the peripheral ones, ethics that used to be seen as an abstract issue is now part of the most expensive contemporary public demands.

Having "applied" or "practical ethics" been accepted into the international academic environment, it is necessary to establish its conceptual sustainable basis, its theoretical support, that is, its epistemological statute. Strengthened after the 60s last century, "applied ethics" comprehends three different fields: business ethics, environmental ethics and bioethics. With the conceptual progress experienced by bioethics after the IV General Conference, in Tokyo, 1998 ("Global Bioethics") and the VI General Conference, in Brasilia, 2002 ("Bioethics, Power and Injustice"), it broadens its horizons much further away from the biomedical field, incorporating wider issues of biodiversity and the respect for environmental balance, among other issues. In this text, I will use this broadened reference of bioethics for the development of the discipline.

Two categories seem to be indispensable to the study of "applied ethics", regarding its utilization as a referential model on the basis of different usages of ethics, including the elaboration of the new teaching-learning processes. The first consists of the respect for moral pluralism evidenced nowadays, as a result of an irreversible process of the secularization of society. Manichean attitudes such as right/wrong, good/bad, just/unjust are no longer considered, and have thus been replaced by more flexible attitudes respecting differences. Social movements that took place during the second half of the 20th century were mainly responsible for its maturation, it began with the women, was followed by the negroes, homosexuals, natives, physically disabled, and others of the so-called "minorities".

The second one is about the fact that knowledge has long ago ceased to be simple to become highly complex. The study of its parts no longer gives way to the understanding of the whole, thus demanding a search for categories that arise from the context where the events occur. The understanding of knowledge complexity implies reality interpreting in its totality, what compulsorily demands a multidisciplinary and integrated sight of the facts by the analyst. The sum of the parts, without an integrated observation and effort, does not add up to integrality. The concept of totality developed by Kosik (1976) does not mean "all facts", but in fact the reality as a structured whole, in which or about which any fact (class of facts, set of facts) can possibly be rationally understood. This way, it follows in the same direction the theory of complex thinking presented by Morin (2002), searching for a possible way of accomplishing the difficult task of linking the pieces into which modern science has fragmented knowledge.

The Education of Ethics in the 21st century, however, should consider and should incorporate these two precious elements of contemporary reality: the respect for moral pluralism and the need for the multidisciplinary understanding of knowledge to what concerns its complexity and totality. Submission to absolute morals, the uncritical acceptance of specific values related to a culture or a religion, or even a previous or anticipated definition of certain debatable values concerning its applicability to different realities, for example, invalidating the initiative of an educational proposal of "applied ethics", according to a reality that has never been dynamic as nowadays, apart from being multiple and constantly contradictory.

Two studies about the inclusion of Ethics as a discipline in high school

Under this topic, it is going to be presented the summary of two recent studies developed by the Bioethics Research and Studies Working Group, of the University of Brasília, looking forward to a possible introduction of this content, or even Bioethics itself as a discipline, in public and private high schools of the Federal District, Brazil.

The first study has been carried out by Medeiros, Barros and Souza (2002) and its goal was to check the main topics to be included in a Bioethics curriculum, as well as, themes, conflicts and/or specific problems. Sixty (60) teachers of 12 public schools (05 from each school) in the Federal District (DF), Brazil, have been interviewed. These 12 schools were divided into 03 different regions according to social classes, 04 were of an upper middle-class district (region I), 04 belonged to a middle-class district (region II) and 04 were of a poor and lower middle-class district (region III). The open answers on general topics about the ethical field that teachers thought that should be tackled in high school were significantly varied from one district to another. The interviewed ones in schools in region I have shown their preference about emergent themes (of boundary or borderline of development) as: values and attitudes, environment, cloning, politics, abortion, professional ethics and organ transplants. Among the teachers of region II, the answers were surprisingly different: prejudice, values and attitudes, citizenship, environment, drugs, abortion and sexuality. The main answers among the interviewed teachers in region III were: values and attitudes, environment, abortion, politics, human life, euthanasia and prejudice.

As one may observe by their answers, the teachers that work in deprived socio-economically areas included answers which were highly related to their social context, where their professional activities were being carried out, such as prejudice, citizenship and drugs, while in highly purchasing power regions the themes which arose were related to scientific and technological progress, cloning and organ transplants. However, it could also be observed a general and indistinct concern in relation to themes as values and attitudes and environment. The final results found were that teachers that work with adolescents in public high schools of DF understand that bioethics should be included in their curriculum, and that educational contents should vary from one region to another, according to their own peculiarities. From observation and answers to the interviews, researchers prepared a proposal for the inclusion of bioethics as a discipline in the researched schools, with basic and flexible contents, according to their reality, with the use of participative teaching-learning methodologies, with appropriate previous text reading and subsequent discussion among students under teacher supervision.

The second study aimed at knowing the opinion of teachers that work in 06 high schools, at Plano Piloto[1] of Brasilia (upper middle-class region), each school having over 400 students, in relation to the possibility of adding a new discipline that could open the discussion proposed by Bioethics. Three (03) out of 06 were public schools (having

1 N.T. plane shaped part of the city

98 interviewed teachers) and the three (03) others were private schools (having 52 interviewed teachers). The majority if the 150 interviewed subjects thought it pertinent to include this new discipline in the curriculum of their schools. A significant answer was that 63% of the teachers thought that the school should take on the responsibility for the making up of values and attitudes of adolescents, together with family attributes. On the other hand, 61% of the interviewed subjects thought the current behavioral content taught in schools to be insufficient.

The results of this research revealed that according to: a) the Brazilian reality; b) the complexity of current knowledge proposed by Morin (2001); and c) social inequalities that restrain the economic development of a country by the suppression of "substantive liberties" pointed by Amartya Sen (2000): current educational content in use, in the researched in schools, should be replaced by a more humanistic view, aiming at the formation of citizens who are conscious of the responsibility in the construction of a more ethical attitude towards the current social and economical grave problems.

Both the above reported studies, thus, direct attention to the need of: 1. having ethics playing a concrete role in the educational content of school curriculum; 2. strictly relating these contents to the reality where the cities are located and where these students live.

Final remarks and conclusions

A macroscopic view of the current world under the light of Ethics shows that a great amount of contradictions, armed conflicts, unbalanced distribution of natural resources and of benefits among central and peripheral countries, social exclusion. In short, a very discouraging picture where the stronger nations, instead of working in search of a solidary balance, preferably act towards perspectives of increasing political and economical *empowerment*. The conclusions of the VI Bioethics International Congress sponsored by the International Association of Bioethics, in Brasilia, at the end of 2002, have only confirmed the hypothesis that power generated by knowledge has given way to more injustice than justice in today's world.

On the other hand, a microscopic and accurate view of the facts and events that happened to occur after the second half of the 20th century in different countries and continents may let us resist in the name of hope for a better world. The leading way to some of the 20th century moral conflicts in several countries and the dawn of the comprehension of cultural plurality began the construction of a new set of moral references to the 21st century human societies. These parameters led people to slowly abandon principles and values that for centuries headed decisions and behaviors, not only at an individual level but also as collective levels, be it at the private or public sphere. It was in this context that ethics has grown in importance, directly or indirectly influencing the transformation of issues like countries positioning in relation to environment preservation or in the intellectual demand for respect for the integrity of the children and the elderly, for example, even attitudes that started to redefine interpersonal, intersexes, interethnic relationships.

As a consequence of all these specified changes which were detected in the field of ethics, the themes in public sectors and the ones related to them have demanded a new approach. Some time ago some ethics issues were handled in a restrict way, almost exclusively as variables of emotional and/or individual derivation. With the transformations and the new rhythm that has begun to be experienced in the international context, the ethical aspects above stated have not been considered of a supra-structural nature anymore, on the contrary, they became a concrete part in the discussion of the issues that involved the future welfare of the people and the communities. The ethical issue, however, has acquired a public identity. It cannot only be

considered as a matter of consciousness to be solved in a private or particular sphere, exclusively personal. All these concerns and attitudes that have already begun to be seen in a practically organic way in the personal field, therefore, need to be transported to the macro ethic behaviors of countries, mainly the most powerful, that are part of the United Nations.

Applied ethics, mainly by means of bioethics, has left behind its main concern for specific and emergent themes directly originated from scientific and technological development. Nowadays, it broadens its performance paradigm and referential mainly in the field of persistent ethical situations, that is, those situations which happen in daily life that should not be happening anymore, once there is so much cumulative knowledge available (GARRAFA & COSTA, 2000).

The dimension of applied ethics, in the sense here presented, is understood as a moral result of a set of social and economical political decisions and measures – collective and individual – that come to provide an increase in citizenship and a reduction of social exclusion (GARRAFA, 1995). The construction of a new ethics to be gone through by modern participative democracies is slow; it still has to be conquered step by step, every single day. Undoubtedly, the path of education is one of the most promising ones for the attainment of these objectives. This way, the 21st century citizen has the right to receive – since the early age – notions about the true societarian values that may contribute to the construction of a better and fairer world.

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Henk ten Have: Towards a universal ethical oath for scientists

1. From the Hippocratic Oath to the Russell-Einstein Manifesto

The idea of an oath for scientists and, in general, of the need for an ethical ruling of any scientific and technological undertaking, has gained strength in recent years as the pace of science has threatened to outstrip the speed at which its ethical implications are assimilated. But the issue is not a new one.

The name of Hippocrates, the celebrated Greek physician (ca.470 b.C.) is well known for having inherited a long medical tradition before his day and having been able to synthesise a whole body of physicians' concerns in the sound formulation of his famous Oath. Independently from the debates about the attribution and the truthfulness of the original document, the Hippocratic Oath still stands as an unquestionable example of medical ethics, aimed at defining the physician's duties and responsibilities.

In more modern times, one may go back to the Lateran Council of 1139, where Pope Innocent II prohibited the use of the crossbow (for its power to kill the knights from a distance, thus out of keeping with the rules of chivalry), as well as to Maimonides (1135-1204), the most important Jewish philosopher of the Middle Ages and court physician to the sultan Saladin. The oath and prayer attributed to Maimonides are second only to the Hippocratic oath in their influence to the ethics of medicine and modern science.

The idea of an ethics for science stands out at the end of the 16th century in the work of Leonardo da Vinci who, being court artist, architect, civil engineer, military planner and weapons designer for the Duke of Milan, buried his own work on submarines "*on account of the evil nature of men, who would practice assassination at the bottom of the sea*". Again this concern is apparent in Francis Bacon's "*New Atlantis*" (1626) where scientists are asserting: "*we (…) take all an oath of secrecy for the concealing of those [inventions and experiences] which we think fit to keep secret; though some of those we do reveal sometime to the State, and some not*".

Many other examples can be found, up to the 20th century, where the interest of the scientific community vis-à-vis ethical issues gains new widespread impetus, certainly also under the influence of the modern wars. Signs of this are spanning from the Canadian "*Ritual of the Calling of an Engineer*" (1926) – a private ceremony where the new engineer would receive a faceted ring and accepted the engineer's oath based on writings by Rudyard Kipling – to the "*Declaration of Geneva*" (1948) – a physician's oath adopted by the General Assembly of the World Medical Association – to the "*Russell-Einstein Manifesto*" (1955) which, subscribed by nine Nobel Prize winners, laid the foundations for the modern Peace Movement, particularly the Campaign for Nuclear Disarmament and the founding of the Pugwash movement.

2. The role of the United Nations and the second half of 20th century

In conformity to their mandate, in the second half of the 20th century; the United Nations started taking slowly on board the issue of the ethical and social impact of scientific and technological progress.

In December 1970, the United Nations General Assembly, at its 25th Session, adopts Resolution 2658, on the "*Role of modern science and technology in*

the development of nations and the need to strengthen economic and technico-scientific co-operation among States". This resolution specifically requests UNESCO to evaluate the main implications of modern science and technology; to suggest ways and means of implementing various recommendations made and measures agreed upon; and to suggest practical ways and means of strengthening international co-operation regarding the new applications of science and technology in the economic and social field.

In August 1973, the United Nations Economic and Social Council, at its 55th Session, adopts Resolution 1826, on the "*Role of modern science and technology in the development of nations and the need to strengthen economic, technical and scientific co-operation among States*". This resolution, and the corresponding "*World Plan of Action for the Application of Science and Technology to Development*", renew the call for UNESCO to play a pivotal role in this field.

In December 1973, the United Nations General Assembly, at its 28th Session, adopts Resolution 3168, on the "*Role of modern science and technology in the development of nations and the need to strengthen economic, technical and scientific co-operation among States*", which fully endorses ECOSOC Res. 1826 (LV).

In November 1974, and in the light of the previous UN Resolutions, the General Conference of UNESCO, at its 18th Session, adopts the "*Recommendation on the Status of Scientific Researchers*".

This document openly recognizes that "scientific discoveries and related technological developments and applications (…) give rise to complex ethical and legal problems". To counter this situation "a highly responsible attitude" is demanded "on the part of the scientific researchers towards [scientific research activity], towards their country and towards the international ideals and objectives of the United Nations (…)".

Among the measures that Member States should take to assist scientific researchers, specific mention is made of the "encouragement of the spirit of community service" and more specifically of the "development and use of educational techniques for awakening and stimulating such personal qualities and habits of mind as: disinterestedness and intellectual integrity; skill in isolating the civic and ethical implications, in issues involving the search for new knowledge and which may at first sight seem to be of a technical nature only; vigilance as to the probable and possible social and ecological consequences of scientific research and experimental development activities".

Furthermore, in the Chapter devoted to "the vocation of the scientific researcher", the documents recommends to Member States to "bear in mind that the scientific researcher's sense of vocation can be powerfully reinforced if he is encouraged to think of his work in terms of service both to his fellow countrymen and to his fellow human being in general." This brings to the definition of "responsibilities and rights" of the scientific researchers, with the use of concepts such as the "spirit of intellectual freedom to pursue, expound and defend the scientific truth", methods of work to be "humanly, socially and ecologically responsible" and the freedom to express themselves "on the human, social or ecological value of certain projects and in the last resort withdraw from those projects if their conscience so dictates".

This whole set of United Nations Resolution, together with the issue of these UNESCO Recommendations have certainly played an important role in strengthening the international interest in the topic. It is not by chance that in the year 1974 "*The Mount Carmel Declaration on Technology and Moral Responsibility*" (Haifa) was also issued.

Despite the fear of many that such vows and guidelines may enshrine a conformity, which

would be incompatible with the creative freedom central to scientific discovery, a number of academic and scientific entities started to thoroughly deal with this matter. The following years are thus spangled with an increasing number of codes, guidelines, oaths, pledges, etc.

The *Uppsala Code of ethics for Scientists* (1984); the *MIT Biologists Pledge* (1987); the *Hippocratic Oath for Scientists* (Nuclear Age Peace Foundation, 1987); the *Buenos Aires Oath* (1988); the *Toronto Resolution* (1991); and the *Scientists Pledge not to take part in military-directed research* (SANA, London 1991) are just but few illustrations of this increasing involvement of the scientific community in the domain of scientific ethics.

3. The UNESCO/ICSU World Conference on Science (1999 WCS)

The 1999 World Conference on Science, jointly organized by UNESCO and the International Council for Science (ICSU) in Budapest (Hungary), devoted a special attention to the issue of ethical principles and responsibilities in the practice of science. At the opening session, Joseph Rotblat is his keynote address plainly stated:

> "I hope that this World Conference on Science will finally convince the scientific community that modern science must take human values into account. By adopting the Declaration on Science and the document Science Agenda – Framework for Action, the participants in this Conference commit themselves to taking responsibility for the ethical issues arising from the pursuit of science (…).

These desiderata should be expressed in an ethical code of conduct for scientists, and formulated in some sort of a Hippocratic Oath. An ethical code of conduct for medical practitioners has been in existence for nearly two and a half millennia. In those days – and still today – the life of a patient was literally in the hands of the doctor and it was essential to ensure that the doctor would wield his power responsibly, with the care of the patient being his foremost duty. Hence the Hippocratic Oath taken by doctors when they qualify.

Nowadays, scientists can be said to have acquired a somewhat similar role in relation to humanity. The time has thus come for some kind of oath, or pledge, to be taken by scientists when receiving a degree in science. At the least, it would have an important symbolic value, but it might also generate awareness and stimulate thinking on the wider issues among young scientists."

These words found clear echo during the *International Forum of Young Scientists*, also held during the Conference, and where in the final recommendations 150 young scientists openly stated to "strongly support the establishment of a scientific Hippocratic oath".

These voices, and others, were carefully taken into account in the conference document "*Science Agenda – A Framework for Action*" which, without explicitly mentioning the oath, keeps the scope of the issue of establishing a set of basic ethical principles to which scientists should adhere and, under Para 3.2 point 71 states: "The ethics and responsibility of science should be an integral part of the education and training of all scientists. It is important to instill in students a positive attitude towards reflection, alertness and awareness of the ethical dilemmas they may encounter in their professional life. Young scientists should be appropriately encouraged to respect and adhere to the basic ethical principles and responsibilities of science. UNESCO's World Commission on the Ethics of Scientific Knowledge and Technology (COMEST), in cooperation with ICSU's Standing Committee on Responsibility and Ethics of Sciences (SCRES), have a special responsibility to follow up on this issue."

This paragraph was fully endorsed by the 30th UNESCO General Conference in 1999, which also decided that "promoting debate, research on ethical issues related to the practice of science and

to the application of science and technology (...) will be pursued in close cooperation with UNESCO's World Commission on the Ethics of Scientific Knowledge and Technology (COMEST) and ICSU's Standing Committee on Responsibility and Ethics of Science (SCRES). The ethics and responsibility of science will become an integral part of science education and the training of scientists promoted by UNESCO."

4. AAAS Committee on Scientific Freedom and Responsibility and ICSU Standards for Ethics and Responsibility in Science (2001)

As a follow-up to the 1999 World Conference on Science, the Committee on Scientific Freedom and Responsibility of the American Association for the Advancement of Science (AAAS) held two meetings, in September 1999 and February 2001, with the primary purpose to generate broader awareness on the issues associated with an oath for scientists and to the possibility of adapting the Hippocratic oath to encompass all scientific disciplines.

Noting that the general public is increasingly aware of the power of science to both create and destroy life, the Committee has been considering whether an oath for scientists, together with a vigorous debate on these issues, is desirable or even necessary.

In the meantime, and still as a follow-up to the 1999 World Conference on Science and of the decisions of UNESCO General Conference, ICSU issued in 2001 its "Standards for Ethics and Responsibility in Science – an Empirical Study". This document, analysing a number of existing standards for ethics and responsibility in science, is SCRES contribution to the task given by the WCS Delegates and UNESCO Member States. The study is also supplemented by an extensive background document: "Standards for Ethics and responsibility in Science: an analysis and evaluation of their content, background and function". These documents, intended as starting point for further discussions in the scientific community, aim at laying proper ground for substantial inquiries and normative discussions, with a view to undertake appropriate action in the field.

As these studies make it clear, ethical standards for science must be formulated with great care and integrity. Asking scientists to be socially responsible, for instance, requires the study of ethics to be of an integral part of their education and training, with the purpose of increasing future scientists' ethical competence. This is essential in determining where the main ethical differences versus similarities lie, thus addressing possible conflicts.

ICSU research, which takes into account 115 ethical standards for science (39 international and 23 national), shows an exponential increase of the number of standards over the years, from mere 6 existing before the 1970s to more than 40 being issued during the last five years. This again is an obvious sign of the fact that the issue has become a burning one.

The conclusion of the study recalls the "wide variety of concerns that are expressed in the standards" and that "many actors have taken an initiative in this field, most of them preferring to convey codes of ethics or ethical guidelines." Commenting on the "near exponential growth of such standards with time", it is clear that "a very natural interpretation of this is that ethical issues are felt to become more and more important, and science cannot be unaffected by this but must take action. (…) The times when science could stay clear of complicated ethical issues are over and (…) ethical issues arise already within the core of the sciences and in the interface between science and the public."

5. The Report of the Secretary-General Policy Working Group on the UN and Terrorism (2002)

On 11 September 2001, the terrorist attack against the United States of America caused the international community to focus on the issue of terrorism with renewed intensity, thus adding a specific anti-terrorist concern to the science ethics agenda, as it was the case at the end of World War II for the use of nuclear weapons and its dreadful consequences.

As a first response, in October 2001, the UN Secretary-General established a Policy Working Group on the United Nations and Terrorism. Its purpose has been to identify the longer-term implications and broad policy dimensions of terrorism for the United Nations, and to formulate recommendations on the steps that the United Nations system might take to address the issue. In doing so, the Policy Working Group was specifically requested to consider terrorist acts as a threat not simply to human security, but to the very principles and values of the United Nations Charter, thus calling for a coherent and coordinated response by the organizations of the UN system as a whole.

In 2002 the Working Group transmitted its Report to the UN Secretary-General, including 31 Recommendations. Recommendation 21 is of particular relevance to the issue of science ethics: "Relevant United Nations offices should be tasked with producing proposals to reinforce ethical norms, and the creation of codes of conduct for scientists, through international and national scientific societies and institutions that teach sciences or engineering skills related to weapons technologies, should be encouraged. Such codes of conduct would aim to prevent the involvement of defense scientists or technical experts in terrorist activities and restrict public access to knowledge and expertise on the development, production, stockpiling and use of weapons of mass destruction or related technologies."

The UN General Assembly and the UN Security Council endorsed the Report and its Recommendations, transmitting it to all the Organizations and Specialized Agencies of the United Nations System.

At the invitation of the Director-General of UNESCO, a UN Inter-Agency Consultative Meeting was held at UNESCO HQs in Paris, on 26 February 2003, specifically to discuss Recommendations 10 (focused on education, tolerance and respect of human dignity) and 21 of the Report.

One of the outcomes of this UN Inter-Agency meeting was a general recommendation towards "encouraging ethical codes of conduct for scientists and engineers" and "promoting ethics of science education and awareness". The ethical task given by the World Conference on Science to COMEST and ICSU was recalled and reinforced. One of the final recommendations of this meeting is that "existing relevant bodies such as COMEST could in particular play a decisive role in fostering a continued dialogue on education and ethics of science", also recommending the "specific involvement of the COMEST together with ICSU" in the field of the "responsibility of scientists".

6. Analysis of existing codes

The Hippocratic Oath is a recurrent example for other initiatives to develop and implement codes of conduct for scientists in general and scientists in specific areas in particular. It is therefore important to examine the characteristics of the Hippocratic Oath:

It has been developed and implemented by the medical profession itself. The reason is that the Oath articulates the internal morality of the medical profession, viz. the values and norms that are intrinsic to the practice of medicine. Although there might have been external motives to articulate these values (e.g. the efforts of Thomas

Percival to write an encompassing compendium for medical ethics because of internal conflicts in the hospital in Edinburgh, or increasing social suspicions about the altruistic motives of medical professionals), the emphasis is on the responsibility of the medical profession itself to articulate and implement the standards of good care practice.

The implementation of the Oath depends on the voluntary collaboration of medical professionals. The Oath not only implies that new professionals entering the profession assume certain obligations intrinsic to their new profession, but also the medical profession as a whole (represented in medical associations and professional societies) supervises the correct application of the guidelines and rules stipulated in the Oath.

The Oath is a combination of prohibitions and admonitions; it formulates negative rules or prohibitions (e.g. no surgery because of lack of expertise, medical secrecy) as well as positive principles (e.g. beneficence, emphasising the interest of the patient as overriding obligation).

As the ICSU study demonstrates, the development of codes of conduct requires attention to at least three aspects:

a. Form

It is quite interesting to note what format the different standards have. To this end the material was classified into 15 categories (oath, pledge, code, guidelines, declaration, principles, appeal, recommendation, manifesto, statement, declaration, resolution, convention, charter, law, other). According to an intuitive family resemblance, they could also be further clustered in five groups. The oaths and pledges into a 'pledge group'; the codes, guidelines and principles into a 'guidelines group'; the appeals, recommendations, manifestos, statements, declarations and resolutions into a 'statement group'; the conventions, charters and laws into a 'law group'; and still the others.
It seems also worthwhile to note that the number of oath and pledges in the material considered is altogether 6. This low number is certainly caused by the fact that an oath or pledge is perceived to be of a more binding nature than mere guidelines. Which also makes it more difficult to agree upon.

b. Content

The ICSU analysis also tried to identify some of the core traits or virtues that one expects to find in the standards. Honesty, openness, fairness, truthfulness, accuracy, conscientiousness, respect, collaboration and loyalty are but among the most frequently listed individual qualities.

Beside the behaviour of individuals, the analysis isolated a number of features for which the scientific community should stand as a whole. Social responsibility, environmental responsibility, sustainable development, socio-economic development, social welfare, socio economic equity, gender equality, scientific freedom, peace, democratic development, human rights are again some among the most frequently listed traits.

c. Function

A third characteristic of the examined codes of conduct is that they, like the Hippocratic Oath, try to exemplify the internal morality of science in order to ascertain and reinforce the social value of science. In the words of the authors of the ICSU study, "ethics can be seen as the arena of dialogue between science and society, where clarifications on these issues is sought." In this context, "ethical standards serve an important function"; as a matter of fact "though their effect in preventing misconduct may be doubted, they still set a framework or orientation that appears clarifying, in particular for younger scientists". In this regard, "the issue of a scientific oath or a scientific pledge

(…) marks the individual adoption of [ethical] norms by a public act, and thus has a function both with respect to the individual taking such an oath, and with respect to the public that conceives such an act as a normative reference point. However, without the lively debate and continued renewal of codes of ethics or ethical guidelines in science, such an oath or pledge runs the danger of becoming a pure formality without content."

In conclusion, it has to be acknowledged that "the standards (…) appear very similar in their recommendations for individual scientists' conduct. Regarding internal responsibilities that mainly concern the scientific community itself (…) certain *'sine qua non'* – virtues without which the scientific enterprise would scarcely be possible, stand virtually unchallenged, such as honesty, skepticism, fairness, collegiality, truthfulness, accuracy, conscientiousness, respect and openness. Differences emerge more strongly in the regard to external responsibilities."

In the end "SCRES also considers the formulation of a universal scientific oath an interesting project for which the present project analysing ethical standards in science might be a useful beginning."

7. An oath or pledge for scientists

This excursus on the development of the idea of an oath or pledge for scientists provides materials and insights sufficient to facilitate a discussion, which should bring adequate answers and allow COMEST to take up the challenge embodied in the task internationally received. In this regard, the working hypothesis underlying the present document is that a universal ethical oath or pledge for scientists could actually be envisaged, and that COMEST, together with ICSU, could work towards the finalization of its formulation and widespread acceptance.

In ethics of science and technology, and in the domain of ethics in general, a primordial task is to identify a set of values, to be at once generally recognized and globally shared. They would indeed represent, once spelled out, the ethical framework that scientists and students are consciously or unconsciously accepting when they get into their scientific activity. Now, an abstract set of values integrating a fundamental ethical character can be manifested concretely in the utterance of an oath, or pledge. These two notions not being identical, they could for our purposes still be treated as equivalent inasmuch as they share a number of essential features, containing the elements of testimony, promise, word of honour and warrant. Both are indeed performative utterances, which carry moral weight, thus resolving themselves into public assertions of commitment to uphold specific principles or responsibilities.

As already mentioned, an oath makes appeal to a principle, or a set of principles, which must be universalizable, i.e. applicable to all individuals in similar circumstances. The oath appears indeed as a privileged way to ensure personal involvement and open engagement as expressed through the public commitment constituted by the declaration of ethical principles, which each one accepts to subscribe to.

Also in this line, a broad Oath covering the various scientific disciplines seems to present the undeniable advantage to unite and bind each and every scientist at once around a hard core of generally accepted principles – an ethical framework – still leaving to each specific discipline the responsibility to keep the debate up-to-date, and elaborate more particular and detailed codes of conduct to encompass and address specific cases and issues.

The purpose of an Oath, for its own nature, cannot consequently be to bind any scientist, in any field, and in any circumstances, to behave exactly in the same way. On the other hand, and more modestly, a broad universal ethical Oath is indeed aimed at ensuring that two scientists in the same field, and in similar circumstances, would feel bound to behave according to the same (given) code of conduct. And to follow it. Without preventing all unethical behaviours, it can

be expected taking an Oath or pledge upon entering the scientific profession would have a positive impact on any scientist(s), thus fostering a sense of collective responsibility.

As it was well put elsewhere, "the adoption of a code (...) is one of the external hallmarks testifying to the claim [of] an obligation to society that transcends mere economic self-interest" (H.C. Luegenbihel, *Ethical Issues in Engineering*, 1991). This statement stands equally valid, and easier to implement, in the case of an oath or pledge. In this view it seems appropriate to list hereunder a preliminary non-exhaustive collection of oaths or pledges, which are reproduced not to undertake an in-depth analysis but rather with the mere purpose of inspiring a brainstorming exchange and stimulating a debate. This exchange may hopefully lead to the embracement of one of the existing formulations or to the elaboration of a more comprehensive and encompassing one.

8. Samples of short formulations of a "Hippocratic Oath" for scientists

A. "I will not, knowingly, carry out research which is to the detriment of humanity. If, in the event, research to which I have contributed is used, in my view, to the detriment of the human race then I shall work actively to combat its development." – Sir Arnold Wolfendale, President European Physical Society

B. "I pledge to investigate thoroughly and take into account the social and environmental consequences of any job opportunity I consider." – Graduate pledge of social and environmental responsibility (Humboldt California State Univ., Stanford Univ, M.I.T. and dozens of other colleges and universities).

C. "The purpose of science should be the general enhancement of life and not the causing of harm to man. I affirm that I will uphold this principle, in teaching and in practice of my science, to the best of my ability and judgement." – Charles L. Schwartz, Professor Emeritus, University of California, Berkeley.

D. "I vow to practice my profession with conscience and dignity; I will strive to apply my skills only with the utmost respect for the well-being of humanity, the earth and all its species; I will not permit considerations of nationality, politics, prejudice or material advancement to intervene between my work and this duty to present and future generations; I make this Oath solemnly, freely and upon my honour." – Institute for Social Inventions (Hippocratic Oath for Scientists, Engineers and Executives).

E. "I promise to work for a better world, where science and technology are used in socially responsible ways. I will not use my education for any purpose intended to harm human beings or the environment. Throughout my career, I will consider the ethical implications of my work before I take action. While the demands placed upon me may be great, I sign this declaration because I recognize that individual responsibility is the first step on the path to peace." – Student Pugwash Group, USA

F. "At the time of being admitted as a member of the medical profession: I solemnly pledge myself to consecrate my life to the service of humanity; I will give to my teachers the respect and gratitude which is their due; I will practice my profession with conscience and dignity; the health of my patient will be my first consideration; I will maintain by all the means in my power, the honor and the noble traditions of the medical profession; my colleagues will be my brothers; I will not permit considerations of religion, nationality, race, party politics

or social standing to intervene between my duty and my patient; I will maintain the utmost respect for human life from the time of conception; even under threat, I will not use my medical knowledge contrary to the laws of humanity; I make these promises solemnly, freely and upon my honor." – Declaration of Geneva. Adopted by the General Assembly of World Medical Association at Geneva Switzerland, September 1948.

An Engineer's Hippocratic Oath

In: Ch. SUSSKIND, Understanding Technology, Baltimore and London: The John Hopkins University Press, 1973, p. 118.

1. I solemnly pledge myself to consecrate my life to the service of humanity.
2. I will give to my teachers the respect and gratitude, which is their due;
3. I will be loyal to the profession of engineering and just and generous to its members;
4. I will lead my life and practice my profession in uprightness and honor;
5. Whatever project I shall undertake, it shall be for the good of mankind to the utmost of my power;
6. I will keep far away from wrong, from corruption, and from tempting others to vicious practice;
7. I will exercise my profession solely for the benefit of humanity and perform no act for a criminal purpose, even if solicited, far less suggest it;
8. I will speak out against evil and unjust practice wheresoever I encounter it;
9. I will not permit considerations of religion, nationality, race, party politics, or social standing to intervene between my duty and my work;
10. Even under threat, I will not use my professional knowledge contrary to the laws of humanity;
11. I will endeavour to avoid waste and the consumption of non-renewable resources.
12. I make these promises solemnly, freely, and upon my honor.

The new Archimedes' oath

Institut National Polytechnique de Grenoble (2000)

1. I will practise my profession abiding by the ethics of human rights and I will be aware of my responsibility for mankind's natural heritage.
2. In all acts of my professional life I will assume my responsibility towards my institution, towards society and towards future generations.
3. I will pay special attention to promoting fair relations between all men and supporting the development of economically underprivileged countries.
4. I commit myself to explaining my choices to decision- makers and citizens, making these choices as transparent as possible.
5. I will give priority to the forms of management permitting broad co-operation between all the actors with a view to making everyone's work and innovations meaningful.
6. I pledge myself to respecting ethical codes as well as examining and using means of information and communication critically.
7. I will take special care to honing my professional skills in all aspects of technological, economic, human and social sciences involved in my work.

International Network of Engineers and Scientists for Global Responsibility (INES)

Appeal to Engineers and Scientists -

Opened for signature on July 16, 1995, the 50th anniversary of the first nuclear explosion (Trinity Test).

In adherence to the UNESCO Declaration for Scientific Professionals of November 1974, INES attempted to harmonize existing pledges into the following code of ethics:

Pledge

1. I acknowledge as a scientist or engineer that I have a special responsibility for the future of humankind. I share a duty to sustain life as a whole. I therefore pledge to reflect upon my scientific work and its possible consequences in advance and to judge it according to ethical standards. I will do this even though it is not possible to foresee all possible consequences and even if I have no direct influence on them.
2. I pledge to use my knowledge and abilities for the protection and enrichment of life. I will respect human rights, and the dignity and importance of all forms of life in their interconnectedness. I am aware that curiosity and pressure to succeed may lead me into conflict with that objective. If there are indications that my work could pose severe threats to human life or to the environment, I will abstain until appropriate assessment and precautionary actions have been taken. If necessary and appropriate, I will inform the public.
3. I pledge not to take part in the development and production of weapons of mass destruction and of weapons that are banned by international conventions. Aware that even conventional arms can contribute to mass destruction, I will support political efforts to bring arms production, arms trade, and the transfer of military technology under strict international control.
4. I pledge to be truthful and to subject the assumptions, methods, findings and goals of my work, including possible impacts on humanity and on the environment, to open and critical discussion. To the best of my ability I shall contribute to public understanding of science. I shall support public participation in a critical discussion of the funding priorities and uses of science and technology. I will carefully consider the arguments from such discussions which question my work or its impact.
5. I pledge to support the open publication and discussion of scientific research. Since the results of science ultimately belong to humankind, I will conscientiously consider my participation in secret research projects that serve military or economic interests. I will not participate in secret research projects if I conclude that society will be injured thereby. Should I decide to participate in any secret research, I will continuously reflect upon its implications for society and the environment.
6. I pledge to enhance the awareness of ethical principles and the resulting obligations among scientists and engineers. I will join fellow scientists and others willing to take responsibility. I will support those who might experience professional disadvantages in attempting to live up to the principles of this pledge. I will support the establishment and the work of institutions that enable scientists to exercise their responsibilities more effectively according to this pledge.
7. I pledge to support research projects, whether in basic or applied science, that contribute to the solution of vital problems of humankind, including poverty, violations of human rights,

armed conflicts and environmental degradation.

8. I acknowledge my duty to present and future generations, and pledge that the fulfillment of this duty will not be influenced by material advantages or political, national or economic loyalties.

Cowboy Code ;-)

Gene Autry Survivors Trust, 1994

1. *The Cowboy must never shoot first, hit a smaller man, or take unfair advantage.*
2. *He must never go back on his word, or a trust confided in him.*
3. *He must always tell the truth.*
4. *He must be gentle with children, the elderly, and animals.*
5. *He must not advocate or possess racially or religiously intolerant ideas.*
6. *He must help people in distress.*
7. *He must be a good worker.*
8. *He must keep himself clean in thought, speech, action, and personal habits.*
9. *He must respect women, parents, and his nations laws.*
10. *The Cowboy is a patriot.*

9. The way forward

The proposal hereby submitted to the COMEST is to seize the task received by the United Nations and the World Conference on Science and work on this subject so as to be given, at the next General Conference (2005), a mandate from UNESCO Member States to prepare a Declaration (including an Oath or pledge) in this area by 2007.

A first step in this regard would be to highlight this point in the report of the present session of COMEST, which will be submitted to UNESCO Executive Board in its next session (April 2004), asking to submit to the General Conference a "Preliminary evaluation and studies towards the definition of a code of conduct for scientists".

On this basis, during the next months, the following questions need to be answered:

What kind of code would be feasible? In other words, what type of normative action will be required; the answer has to specify several issues:

Is a code desirable on a general level covering science in general, or are specific codes desirable for particular scientific disciplines?

Does a code need to have general character or does it need specific requirements, or a combination of both

The character of the code: focusing on an Oath and/or pledge

The contents: what should be included in the code?

Consensus building: how can within the scientific community support be acquired for the development of the code?

Political support: how can adequate political endorsement of the code be found?

Strategies of implementation: what should be the effective ways of implementing the code, once it has been developed, has support of the scientific community, and is politically supported?

Simon Schwartzman: Do we need a new code of conduct for scientists?

It is possible to talk about codes of ethics or conduct from a purely normative point of view, and try to establish, from reasoning and moral principles, a list of appropriate and inappropriate behavior that people should abide. It is also possible to look at it from a sociological point of view, and ask why such codes emerge, and the roles they perform. As a social scientist, I prefer the second approach, which leads to a better conceptual and empirical basis, on which moral concerns can be grounded.

The Center for Study of Ethics in the Professions, at the Illinois Institute for Technology, has a collection of over 850 codes of professional ethics available on the Internet, limited to English language sources.[1] This proliferation suggests that, first, codes of ethics or conduct are considered something necessary and important; and, second, that there is no clear consensus on what this code should be like – if there were, one simple code for all would be enough.

Codes of ethics are essential to the learned professions, to sustain their claim that they should be responsible for their own standards, and controlled for within, rather than being controlled by external clients or supporters. This autonomy and authority is based on trust, and can only be maintained if there is an agreement, within and outside the profession, that the professionals are working for the common good, rather than for their own private benefit. They are also functional for the internal work of the professional communities. According to one author, "modern professions adopted his innovation, codes of ethics, because they needed its fundamental elements: a) common standards (to support extensive cooperative endeavors); b) the minimization of the interpersonal strife that the emphasis on individual honor encourages; and c) a framework of wills that permits professionals to assert their independence of their nominal employers in the name of service to others."[2]

Traditionally, scientists have argued that they are guided by two values, the advancement of knowledge and the advancement of mankind. From modern times, these two values were assumed to be in harmony. In the 1930s and 1940s, two main strains of thought have followed from these assumptions. One, made famous by the work of Robert K. Merton, is that science should remain independent and self-regulated, avoiding the temptations of politics or markets. The other, made famous by J. D. Bernal and his followers, was that scientists, because of their superior knowledge and competence, should get involved in politics and in the economy, to make rationality to prevail.[3]

In spite of their bitter opposition, the two visions shared the notion that scientists belonged to a well identified profession, defined by their unconditional commitment to the search for truth through the use of reason and rational investigation. This simple vision was shattered, in recent years, by two developments. The first was the end of the modern belief on the inherent goodness of the advancement of knowledge and

[1] Center for the Study of Ethics in the Professions and Illinois Institute of Technology, Code of Ethics on line (2003 [cited November 16 2003]); available from http://www.iit.edu/departments/csep/PublicWWW/codes/..

[2] Robert Denio Baker, "Codes of ethics: some history," Perspectives on the Professions 19 (Fall, 1999).

[3] J D.. Bernal, The social function of science, The M.I.T. Press paperback (Cambridge, 1967), Robert King Merton, The sociology of science - theoretical and empirical investigations (Chicago, 1973).

technology[4]. The second was the breakdown of the dividing lines between science, technology, engineering, government, industry, business, and education.[5]

It is difficult to argue, in this situation, that there is still a unified scientific profession (if it ever existed), with a common set of values. It is hard to sustain that the scientific norms listed by Merton half a century ago – universalism, organized skepticism, disinterestedness and communism (open communication and common ownership of knowledge) still prevail. After Stalinism, there is little left of Bernalism. And yet, the powers of science, for good or bad, are much stronger today than in those years.

This is perhaps the explanation for the paradox mentioned at the beginning – intensive efforts to develop new codes of conduct for scientists, and a lack of clarity of what these codes should contain or to be like. Scientists feel the need because they feel they are losing their autonomy and intellectual independence; society feels the need because it does not trust the scientists anymore, and want to know exactly what is being done, at what price, and with what consequences.

The new codes of conduct, therefore, should be the product of difficult negotiations between scientists and society, to recover, if possible, the old relationship of trust, without which science cannot develop and be made useful. They cannot be written by the scientists alone, and cannot be imposed on them from outside. They should be specific to different areas of activity, but it is not impossible to list some of their central features. Modern codes of conduct should add, to Merton's list, the values of social accountability and responsibility for the consequences of research. Disinterestedness and communism are difficult values to hold, in this era of proprietary knowledge and science and technology as business; universalism and organized skepticism remain as important today as in the past.

Finally, the codes of conduct for science and technology should not be applied only to professional scientists, but to the institutions, public and private, that deal with knowledge and their applications. And they should not be enforced only from within the professions, as in the past, but also from outside, through well defined legislation, oversight bodies, and the judiciary.

It is a much more complicated world, likely to create problems for the development of scientific work, and place undesirable limits to the use of scientific advancements for the common good. These difficulties, however, are unavoidable, and cannot subside as new relations of trust between science, technology and society are created and established.

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Roque Monteleone Neto: Biology and codes of conduct

Introduction

The focus of these comments is on the area of biology. This is the area of science and technology that currently is under the scrutiny of many different fora due to the enormous development and achievements in the past two decades and the possible consequences for mankind.

Biotechnology and biological weapons are two aspects of biology that appear almost daily in the media and, therefore, it is worth to start with them.

The mention to biotechnology is because of its achievements related to new drugs, new possibilities to interfere in the life process itself, to promote development as well as and the fear of the unknown, including the possibility of its application to develop new or modified biological agents to be used as a weapon.

On the other hand, biological weapons and bioterrorism suddenly became a very important issue and discussions on the highest levels of governments and in the international community on how to avoid its development and use are taken place.

Conversely, there has been no success in agreeing on a strengthening protocol for the existing regime contained in the Biological Weapons Convention (BWC) which has left the regime without a verification mechanism, as we will see later on.

The ultimate element that added urgency into this discussion was the incident of the "anthrax letters" that happened in the United States just a few weeks after the terrorist act to the World Trade Center, in New York, in September 2001. After this tragic event, some governments and the media have devoted special, and sometime misguided attention to these issues. Maybe more important the suspicion of the existence of biological weapons has been used to justify, among others as a reason for the invasion of Iraq and the demise of the Hussein´s regime.

The apparent suicide of a British scientist expert in biological weapons, Dr. David Kelly, is under inquiry since the case may involve information contained in the so called British government dossier related to the reasons why the United Kingdom went to war in Iraq and the BBC that revealed an apparent manipulation of such information.

The prohibition of biological weapons

The use in armed conflicts of biological weapons, as well as of chemical weapons, was prohibited by the Geneva Protocol in 1925. To date more than 130 States have ratified, acceded to or upon independence declared succession to the Geneva Protocol. This Protocol was proposed mainly because the use of chemical weapons by Germany during W.W.I. (http://www.unidir.ch/bdd/fiche-article.php?ref_article=1343).

On the other hand, the Biological Weapons Convention, entered into force in 1976, is more comprehensive and prohibits the development, production, stockpiling, transfer or acquisition of biological agents and equipment for hostile purposes (http://www.opbw.org/).

146 States have ratified or acceded to the BWC. Initially States signed the BWC with no verification provisions and in 1991 the III Review Conference established a process to strengthen the Convention through the technical identification and examination of possible verification measures.

In 1994 a Special Conference took note of the work done and established a mandate to negotiate a Verification Protocol to this Convention.

In November 2001 the V Review Conference could not agree to the proposed Protocol containing the basic elements of declarations, inspections, investigations of alleged use and promoting cooperation for peaceful uses of biology.

On the final session of this Review Conference held in 2002, in Geneva, taking into account the failure of the process, a working programme up to 2005 was established. The topic for 2005 will be the discussion of a "Code of Conduct".

In order to proceed it is important to understand the significance of this process and its background, since the Verification Protocol was discussed by the States Parties for at least 10 years and its final version was rejected on its totality by the US delegation which justified its position due to "national security" and concerns over commercial proprietary rights.

The events that will be briefly presented may help to understand, but not to justify, such failure in the BWC negotiation to establish a verification Protocol, as well as they may underline the complexity of the subject.

In the aftermath of the Iraq War, in 1991, UNSCOM - United Nations Special Commission, was able to uncover a secret biological weapons programme (http://www.un.org/Depts/unscom/). The investigation of this programme revealed the involvement of scientists and universities, as well as the security apparatus of the former Iraqi government. At that time Iraq had signed, but not ratified the BWC.

In March 1995, Aun Sect released sarin in a subway in Tokyo raising the question of whether terrorist groups have interest in using weapons of mass destruction as a means to achieve its goals. The investigation of this event showed that the sect was actively pursuing the development of a biological weapon, since samples of Clostridium botulinum, Bacillus anthracis and Ebola virus were found on the laboratories of the sect and previous attempts to use these agents have failed to produce victims (http://www.slu.edu/organizations/airrotc/cadetinfo/class/AS400/anthraxAPJ1.pdf). A Ph.D. in genetic engineering who belonged to the Sect was prosecuted and sentenced to death penalty.

Advances in bioscience and "dangerous research"

In 1997, a group of Russian scientists, published in the open scientific literature, an article showing that by using genetic engineering techniques it was possible to induce infection in vaccinated hamsters by using modified strains of Bacillus anthracis (Pomerantsev et al. Expression of cerolysine AB genes in Bacillus anthracis vaccine strains ensure protection against experimental hemolytic anthrax infection. Vaccine 15, 1846-1850, 1997).

In 1998 the FBI recorded more than 150 hoaxes involving anthrax, compared to a single one in 1997 (Tucker JB. Toxic Terror. Introduction. pp.3. MIT Press, Cambridge, Massachusetts, London, England. 2000)

In February 2001, Australian researchers published in the open scientific literature a mousepox experiment, in which interleukin-4 (IL-4) gene was inserted into the mousepox virus and in so doing created a pathogen that was lethal to 60% of mice vaccinated against the disease

(Jackson RJ et al. Expression of mouse interleukin-4 by a recombinant ectromelia virus suppresses cytolytic lymphocyte responses and overcomes genetic resistance to mousepox. J Virol. 2001 Feb; 75(3):1205-10).

. This work immediately raised the question of whether the introduction of IL-4 into other orthopox viruses, such as smallpox, would have similarly lethal effects. It also drew attention to the absence of internationally agreed rules on how to handle research results that could be misused.

In October 2001, just after the terrorist attack to the World Trade Center, in New York, letters containing anthrax were distributed by mail to several people at different locations in the US, including members of the Parliament. A large number of exposed persons had to be treated and some died from this attack. The FBI investigation on this event is still going on and no one was found responsible yet. Recent developments made public in the last issue of Science revealed that high technology was employed to enable the aerolization of the anthrax spores used, raising serious questions about the possible perpetrators (Matsumoto G. Science 28 November 2003, 302: 1492-7).

In September 2003, a team of US scientists made public at a biodefense conference that using techniques similar to those of the Australian experiment they could obtain 100% lethality in mousepox vaccinated and antiviral treated mice (http://www.eurekalert.org/pub_releases/2003-10/ns-udl102903.php).

The need to establish limits: issues and proposals

Other than highlight the fact that, once more, science goes faster than the setting up of controls and limits that society finds necessary or appropriate, the recognition of this does not solve the problem, but add some perspective that may help to have a more rational debate on this subject.

Two different important questions arise: 1) the need to have limits related to potentially dangerous research in biology; and 2) the need to strengthen the prohibition of biological weapons.

These two questions have some aspects that should be analysed. While the need to establish limits to potentially dangerous research is directed to an activity basically linked with individual skills and expertise, the need to strengthen the prohibition of biological weapons relate to State politics.

Therefore, a "Code of Conduct" might be appropriate to address the first question, but ineffective to address the second one.

The other aspect is that the first question is not a question of prohibition, because it is not wise or desirable to abolish research as an important human achievement and one of the basic rights of freedom. On the other hand, the second question is a prohibition that already exist in order to protect mankind, but needs to be strengthened through multilateral negotiations and achieve universal adherence and proper verification of compliance.

Another important observation is that it is expected that there will be different "Codes of Conduct" between countries according to their cultural as well as scientific and technological development. It is not possible to envisage a universal Code of Conduct on such a complex subject. On the other hand the prohibition contained in the Biological Weapons Convention

is aimed to achieve universality, and up to now more than 140 States have agreed to this goal.

It is also important to note that there is not a direct relationship between the need to limit potentially dangerous research and the prohibition of biological weapons, since potentially dangerous legitimate research is performed with the aim not to develop a weapon, but to protect or to give better tools to fight human, animal or plant diseases.

The need to limit potentially dangerous research in biology and the need to strengthen the prohibition of biological weapons cannot and will not be answered only by these two proposed actions, because the problem is much more complex and no simple answer exists.

Industry, particularly the pharmaceutical sector, specially those that have incorporated new technologies should develop its own controls, because it is well known that for each useful molecule discovered more than one hundred are potentially dangerous. The same may also be said in the areas of veterinary and plant industries. Whether these controls have to be established by States or on a voluntary basis is an open question, but beforehand it is expected that differences in development and perceptions among States will determine different degrees of participation of the State in the establishment of these controls, as well as on its enforcement.

Related to the first question, there is an initiative that has been placed by Matthew Meselson and Julian Robinson from the Harvard Sussex Program on Chemical and Biological Weapons Armament and Arms Limitation on a new Convention to Prohibit Biological and Chemical Weapons under International Criminal Law (http://www.sussex.ac.uk/spru/hsp/IntroConvRev1.pdf)

The rationale behind this proposal is that "any development, production, acquisition or use of biological or chemical weapons is the result of decisions and actions of individual persons, whether they are government officials, commercial suppliers, weapons experts or terrorists".

The proponents argue that "the international conventions that prohibit these weapons are directed primarily to the actions of States, and address the matter of individual responsibility to only a limited degree". Moreover, that "the BWC and the CWC stop short of requiring a State Party to establish criminal jurisdiction applicable to foreign nationals on its territory who commit biological or chemical weapons offences elsewhere -- and neither convention contains provisions dealing with extradition".

Another more general and recent proposal regarding limits and rules applicable to research on dangerous pathogens is by John D. Steinbruner, professor of public policy at the University of Maryland and director of the Center for International and Security Studies at Maryland (CISSM) and Elisa D. Harris, a senior research scholar at CISSM and former director for non-proliferation and export controls on the US National Security Council staff (http://www.cissm.umd.edu/documents/pathogensmonograph.pdf).

By this proposal that is still under review, committees of experts should be established at different levels from local to international levels that should oversee and establish rules applicable to certain potentially dangerous activities and agents of concern that have to be followed by those engaged in such activities or working with those agents.

While trying to avoid the politics of States, it is interesting to note that both proposals are directed to individuals but they act through States to obtain approval.

The proposal by Meselson and Robinson apparently solves the problem, but it is possible to anticipate that they will find enormous difficulties

for a wide acceptance because while solving one problem it introduces a bigger one that is the idea of extraterritorial or the concept of "universal jurisdiction". My feeling is that this will be widely accepted only when sovereign States do not exist any more, meaning that the international system embodied in the United Nations should be changed first. Although not impossible this is an enormous and very difficult task to face.

The other proposal by Steinbruner and Harris is still under continuing review, but is possible to imagine that universal adherence will be difficult, since as pointed out above there are differences in cultural background and development among States as well as different perceptions of the threat involved, mainly if the authors link their proposal with the idea of the prohibition of biological weapons. But in any case, this proposal could be adopted in some countries or by some institutions.

Conclusions

Before proceeding and action taken on the subject of establishing a "Code of Conduct", it is my view that a more fundamental question has to be properly answered. The question is why should only biologists be restrained in their activities due to potential danger and not other scientists too, like the physicists or even other professionals, like those working in the financial international markets?

Nuclear bombs are the result of research and development in physics and in some countries currently there are new efforts towards the developments of tactical nuclear bombs that for sure will involve several hundreds of skilled professionals (http://www.spacewar.com/2003/031119083219.5yckcfta.html).

To the question on nuclear research it is well known that a "Code of Conduct" is useless because the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) allows the US, Russia, France, UK and China to have nuclear arsenals, so their fellow scientists and other related professionals would not follow the Code, or would they?

To the volatility of the international financial market no other comments than it could produce more deaths than the sarin terrorist attack in Tokyo or the anthrax letters did in the US.

Therefore, it seems to me that the only viable solution to the problem of proliferation of weapons of mass destruction, specially biological weapons, is through political negotiations, because only negotiations can appropriately deal with all the different issues, aspects and interests involved. Only negotiations can provide a proper way to engage the sovereign power of States, as simple as that, but as problematic as the complexity of the subject deserves.

To finalize, since we are talking about ethics and rights related to activities that have direct influence on power, it is proper to end up these comments with reference to Tuck by saying that we will go back to pre-Kantian discussions if it is not recognized that only politics will solve the conflict among different ethics (Tuck R. The Rights of War and Peace. Oxford University Press. 1999).

Bert Gordijn: From utopian dreams and apocalyptic nightmares towards a more balanced view

The paper 'From utopian dreams and apocalyptic nightmares towards a more balanced view' by Bert Gordijn is not available on the Internet but can be found in the paper version of the present Proceedings."

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Fernando Galembeck: Ethical issues of nanotechnology

Any new technology raises ethical issues. Some questions are common to many areas and others are specific to a given technology. There is now a hot debate on the dangers brought by nanotechnology[1] and some catastrophic views are often voiced,[2,3] while others embrace nanotechnology as a great panacea. In this presentation I will start by giving a short view on nanotechnology and then I will address problems related to privacy, intellectual property, the environment and employment.

A view on nanotechnology

Nanotechnology is a recent word associated to one or more of the following ideas:

i) The properties of matter may show profound changes when it is divided in nanosized particles or organized in structures with characteristic dimensions in the nanometric range, this means, the molecular size range. Examples of peculiar properties of matter in the nanometric size range are quantum confinement and superplasticity.

ii) Powerful new functional or structural materials are built by mounting nanometric constituents into arrays with designed performances unmatched by more conventional materials, thus creating new, powerful and highly "intelligent" devices and building materials endowed with complex behavior *by design*. "Complex" and "intelligent" behavior is defined by the possession of characteristics like: self-assembly, self-guidance, self-reporting and feedback triggered by the environment.

iii) Nanotechnology is not a new technology specific for a given industrial sector. It is pervasive and its ideas, methods, products and processes are affecting every sector of the economy, from the agribusiness to industry and health, communication, information, financial and other services.

There is a strong tendency to associate nanotechnology to atom or molecule individual manipulation. Some Internet sites stress this idea[4] but I cannot agree with it, just because Avogadro

[1] A Google search in the Internet using the keywords "Nanotechnology" and "Ethics" discloses 40.600 entries (November 26 2003).

[2] Just to give a flavor of of this debate, a compilation by Dr. Ron Epstein (Philosophy Department, San Francisco State University < epstein@sfsu.edu>) contains the following titles: "No Small Matter! Nanotech Particles Penetrate Living Cells and Accumulate in Animal Organs", "Opposition to Nanotechnology" by Barnaby J. Feder, "DNA nanoballs boost gene therapy","Nano litterbugs? Experts see potential pollution problems" by Doug Brown ,"Drexler warns terror symposium: nanotech has "extreme downsides" by Doug Brown, "Nanotech's dark side debated in the aftershock of Sept. 11" by John Carroll, "U.S. regulators want to know whether nanotech can pollute" b Doug Brown, "Nano, No and No Again" by Gard Binney, "Patenting Elements of Nature: No Patents on Non-Life Either!", "No Small Matter! Nanotech Particles Penetrate Living Cells and Accumulate in Animal Organs", "Why the Future Doesn't Need Us" by Bill Joy.

[3] For some references: www.ethicsweb.ca/nanotechnology/bibliography

[4] In http://nanotech-now.com/ethics-of-nanotechnology.htm we can read: "Imagine a world in which … cars can be assembled molecule-by-molecule, garbage can be disassembled and turned into beef steaks, and people can be operated on and healed by cell-sized robots"

number is too large[5]. Consequently, many nanotechnology processes are dependent on self-assembly and other techniques suitable for orderly handling very many molecules or particles at once. Another widespread idea is that nanotechnology is something absolutely new that started a few years or decades ago.[6] However, the origins of nanotechnology are traced back to Michael Faraday two centuries ago[7] and some large-scale current industrial products such as auto tires are strictly dependent on nanosized particles and other nanostructures.[8]

Privacy

Nanotechnology is having a powerful impact on privacy and control of individuals. This is a continuation from the impact of microelectronics[9] and information technologies in building up and exploiting very large data bases that now facilitate to governments, corporations and even individuals the accumulation of information on individuals, with or without individual or societal consent. Thanks to the Internet, access to information became very open and directed information circulation is easier than ever. Current nanotechnology brings two important contributions to this picture: the new and powerful data acquisition and handling systems, including the integrated sensing and reporting self-guided devices.

Integrated GPS and microcomputer systems now allow an individual to find the best trekking path in the wilderness, and this is wonderful. On the other hand, this also allows Big Brother to keep track of an individual in the wilderness, not to say in a city or a rural area. There is no foreseeable limit to integration and miniaturization in the next few years beyond the limits imposed by the molecular organization of matter and it is quite likely that implantable chips are increasingly available, endowed with powerful functions for remote monitoring of any person's activities.

On the other hand, we are witnessing great advances in the neurosciences, for instance those related to the direct collection of information from the brain centers and the remote implementation of decisions from these centers. Of course, this also makes possible the flow of external signals and decisions to these centers, making it possible the robotization of individuals.

However, to be frank it seems to me that individual control and manipulation is now being done very efficiently and using rather different technologies that belong to the class of *social engineering*. I refer to the use of technologies based (with or without acknowledgment) on concepts like Susan Blackmore's *memes*,[10] as they are widely practiced by some religious organizations, as well as leaders of marginal human sub-populations and that operate based on the principles of self-

[5] It is not likely that production of any good in gram amounts can be done by individual atom manipulation, just because the Avogadro number is 6.1023 atoms/mol. Thus, to assemble one gram of atoms by nanomanipulation, the nanohandling machines have to make ca. 1021 moves. A production unit with one-billion atom-mounting devices, each capable of mounting one atom per microsecond will take 1 million seconds (or 300 hours) to assemble just one gram of atoms.

[6] As in this quotation from the Institute of Physics webpage: "In a paper published today in the Institute of Physics journal Nanotechnology, Canadian researchers from the University of Toronto Joint Centre for Bioethics (JCB) claim that although the research is still in its early stages and most applications may be decades away, the backlash against the new technology is already gathering momentum."

[7] Faraday assigned the blue and red color of gold particle dispersions in water to the subdivision of gold in very small particles. Very thin gold sheets are green, not yellow.

[8] There is not a good auto rubber that is not filled with nanosized carbon black particles. Scientific understanding of this requirement still lags well behind its technological use.

[9] Microelectronics is now better called nanoelectronics, since the current state of the art allows a 90-nm resolution.

[10] S. Blackmore, The Meme Machine, Oxford 1999.

assembly that are much better adapted to the control of massive populations than individual nanomanipulation.

Intellectual Property

It is obvious that any new technology is strongly associated to intellectual property. What I will say now is from the perspective of a Brazilian scientist, living in a country that struggles to build and maintain a significant scientific system while it pays more interest to the international capital than is spent in public education and public health, together.

Brazilian scientists now make a significant scientific input to nanotechnology, as measured by the number of publications in international refereed journals. Some publications were very well received and made their way to the covers of prestigious journals.

On the other hand, Brazilian scientists do not pay attention to patents, as a rule. Most researchers in Brazil as well as in other countries beyond the G-7 do not read patents and also do not even consider applying for patents, even when their effort is justified in the paper preambles by the possibility to achieve some important practical result.

This leads to two clear consequences:

i) A significant part of our scientific effort is completely wasted, because the objectives of the projects may have already been reached by others and they may be within some patent document. To stress the quantitative importance of this problem, I recall that an estimated 50% of the scientific contents of patents are *never* published in the open literature. This means, the "state of the art" within which we operate is only a part of the actual recorded information, and the missing part is at least as important as the other, from the point of view of property and creation of wealth.

ii) Brazilian scientists are contributing to the literature at a growing rate, bringing in information that will be freely appropriated by other individuals and corporations, much likely abroad. This new information will be finally transformed into products and processes that will be imported into the country, bringing in modernity but also unemployment and pressures on the economy.

This picture can be much improved if only we take seriously patent reading, writing and filing, as individuals, and if our organizations start to give some attention to patents. What is now practiced in Brazil and certainly in other countries is an excessive emphasis on indicators like numbers of publications and impact factors of journals that end up being a mechanism for the transfer of knowledge and intellectual property from the poor to the rich.

Environment

During the past decades we have witnessed an interesting phenomenon in the area of materials production, worldwide. This is the *commoditization* of a large number of materials. Stainless steel, gold finishes, diamond tools, specialty polymers and ceramics have become more and more common with many producers in the world and lower prices.

This brings some advantages as related to the universalization of access to the benefits of technology but it also brings concerns related to the environment with the more widespread dissemination of persistent pollutants. We use today a large amount of battery-powered devices, from watches to cell phones and laptops and this means the spreading of nickel and cadmium in the environment.

As an example, cadmium is especially interesting for its ability to reappear in a new application, after being banned from previous applications. Cadmium pigments have been important in the past but they were eliminated from many

applications such as paint and enamel pigments. Now, there is a large interest in cadmium sulfide nanoparticles for many applications due to their quantum confinement and non-linear optical properties. This means that there will be new environmental risks introduced by the new cadmium nanomaterials.

The solution for this kind of problem is a renewed attention to materials and goods lifecycles: their design, engineering and production should include lifecycle analysis as an integral part as required by legal provisions, regulations and codes. Tax structure from municipalities, states and counties should have provisions for tax reductions on the products supported by a well-established recycling structure, so that we could take maximum benefit from the properties of potentially damaging materials without incurring in excessive risks.

I would like to use some time to tell a story that is a good example on how a new technology can bring new problems and how these can be solved, provided we have a comprehensive lifecycle perspective.

Brazilian northeast is plagued with a low water supply and dramatic water shortages are frequent. On the other hand, there are ample underground deposits of brackish water, in some places, and this led to a significant effort of water pumping and desalination by reverse osmosis membranes. This produced drinkable water together with high-salt rejects from the operation of the membrane systems. These rejects soon became a menace since they could provoke large increases of salinity of the soil and surface waters.

It was thus necessary to find a sink for high-salt content waters and this was made viable in three steps: these waters are first fed to tanks for raising shrimp, wherefrom they flow to tanks were tilapia fish is grown and finally used to irrigate *Atriplex*, a salt tolerant plant that has a high protein content and is well accepted by cattle as a fodder.[11]

This case shows how a problem was created by the introduction of membrane technology, that is an important branch of nanotechnology, and how this problem (the disposal of brackish waters) became a solution to a much greater problem, which is the creation of viable economic activities in a highly disadvantaged area.

We can also expect some major environmental benefits from nanotechnology, for instance in the case of auto tires. These are now a great source of unsolved problems due to the associated recycling and disposal problems. Thanks to new nanotechnology concepts we can now foresee the appearance of recyclable tires, thus solving this big problem.

Employment

Any new technology creates new job opportunities but it also causes the obsolescence of previous technologies with the consequent loss of jobs. Perhaps I don't have to give any example for that, but let me recall that Brazil had a strong and viable industry of radios and TV sets until the early seventies. The introduction of color TV ended up this industry, with thousands of jobs.

It is now estimated that nanotechnology will create 2 million direct jobs worldwide within a decade, but I don't know estimates on how many jobs will be terminated by nanotechnology. I suspect that these will exceed the 2 million figure.

Past experience suggests that most new jobs will be created in a few countries, especially the G7, China and Russia while terminated jobs will concentrate in the other parts of the world.

However, I believe that adequate government strategies may well counter the obvious

[11] This is a Project of the Universidade Federal da Paraíba (now UFCG).

spontaneous trends, creating a more desirable scenario. For instance, in the case of Brazil, I would favor an intensive nanotechnology input in all those areas of the economy satisfying one or more of the following conditions:

i) Activities within the country have reached a status of global competitivity.[12]

ii) Local production is favored by circumstantial advantages, including logistics.

iii) The nanotech input will satisfy local needs that will not receive attention from worldwide technology suppliers.[13]

A nanotechnology area that can satisfy these conditions is the creation and production of new sensors designed for very well-chosen applications. This may have many consequences:

i) To increase the economic competitiveness of Brazilian agriculture by increasing the practice of *precision agriculture*, that depends largely from feeding fertilizers at the adequate levels which in turn depends on a large amount of information on nutrient content in the soil.

ii) To allow a better monitoring of the health of the population by reducing the costs and complexity of laboratory assays required for medical diagnosis.

There are also many opportunities in nanopharmaceuticals and nanomaterials, but their discussion goes beyond the scope of this paper.

[12] Brazil is now the only country in the world producing fuels from renewable sources at prices competitive with oil and without any subsidy. This is the result of more than 30 years intensive science, technology and entrepreneurial efforts.

[13] As for the treatment of locally important diseases as well as mass housing, transportation, water and waste recycling adequate for the tropical environment.

Education

Finally, a word on the impact on education of the new knowledge associated to nanotechnology. Ethical behavior does not prevail within a society of unequally educated persons or among countries separated by large educational gaps. The fast development of nanotechnology is currently widening the educational and economic gaps among individuals and also among countries. I propose that this trend is countered by an effort in improving general education and specially science education standards, especially in those countries that are performing poorly in this respect, such as Brazil, Mexico and others. Of course, science education now has to include topics on nanotechnology since this is one of the faster-moving frontiers of current science and technology.

In Brazil we are ready to start a new moment of great change in science education: we have now qualified persons to lead this effort as well as the motivated teachers and students and, more important them anything else, a widespread awareness of our enormous deficiencies. As soon as we move from the vague speeches and empty governmental announcements to the real action, we will be in a position to have nanotechnology as an ally, not as a menace.

Conclusion

Most of the ethical problems raised by nanotechnology are not new and they have been around for decades, associated to the information technologies, the impact of new materials on the environment and employment, new medicines and diagnosis, mass destruction weapons and other technologies.

We should avoid the hype created by unsound ideas about nanotechnology to concentrate on the real issues and on the solutions for the problems brought by nanotechnology that is becoming increasingly present in our daily life. As any other technology, it will be a friend of those who know

it and a foe of the ignorant. There is nothing really new in this situation if we recall the myths of Icarus, Prometeus and Pandora.

R. C. Salvarezza: Why is nanotechnology important for developing countries?

Nanotechnology (NT) is focused on the creation of functional materials, devices and systems through control of matter at the molecular scale. It is a largely inter-disciplinary activity involving physics, chemistry, material science, biology and engineering. Nanotechnology is just more than a well-defined field of technological activity but simply a term that describes a collection of technologies that evolves with different rates and characteristics.

The rapid progress in NT is based on different facts. The development of new and powerful microscopes advances in our knowledge of materials science and molecular level manipulation techniques, the opinion of prominent scientists about the capability of NT to produce a significant impact on society, and the incorporation of NT in the innovation systems of major industrial countries investing heavily in this sector.

Nanotechnology will affect almost every market either directly or indirectly. It will have impact on industrial manufacturing, electronics, healthcare, pharmaceuticals, transportation, and sustainability. In some cases NT can be seen as a way of making incremental changes to existing markets, or enabling the creation of new markets.

The fast development of NT has turned inevitable the debate about ethical issues. These issues are related to equality, environment (new nanomaterials as potential contaminants), privacy and security (nearly invisible equipment, nanoweapons), self-replicating molecular machines, modifications of living organisms (implanted nanodevices), and the merging of humans and machines. In particular, regulations focused on preventing deliberated destructive action applications, and accident prevention should be done following the directions made in genomics and biotechnology. These regulations can involve access limitations, export controls, professional ethics and inherent safety.

Despite the fact that all these issues are relevant, equality is perhaps more significant from the perspective of developing countries. In fact, there is little doubt that the broader implications of the NT revolution at large will be profound. Many people consider that NT will produce more changes in the societies than those produced by the Industrial Revolution. While it is inevitable that most benefits will go to advanced industrialized nations, there are benefits that should be global. The development of Nanotechnology in the first world should have the potential to make a positive impact in energy, health, and biodiversity, main issues for developing countries. For example, NT-based systems could produce a safer drug delivery; new methods for prevention, diagnosis and treatment of diseases, new biomaterials for implants; more efficient and cleaner energy production, distribution, and storage; new sensors to protect the environment. Nanotechnology can also improve agricultural yields by providing more economical procedures for water filtration and desalination.

However, in the previous scenario developing countries appear as passive actors who benefit from NT advances in industrialized countries. This could contribute to become even deeper the economical and technological dependence, turning them simply into NT importers. It should instead contribute to make major differences in

the quality of life and environment throughout the globe. For this reason, and the others ethical issues previously mentioned, some people have proposed to slow down or even completely stop research and development on NT. However, stopping nanotechnology through regulations is effectively impossible taking into account the potential benefits that NT promises for societies.

Conversely, other scenarios are possible. Developing countries should see the enormous potential of NT in world transformation and become active actors in the field, such as many of them are now in biotechnology. It might have an impact on their economic development, reducing poverty and improving the standard of living of their societies. Nanotechnology is a good opportunity to overcome the enormous distance that separates the third world from major industrial countries. In fact, the rapidly expanding field of NT is open to completely new routes and strategies that could render obsolete the present technologies in a near future.

While a few areas of NT have continued a steady advance towards commercialization, most of the fields covered by this activity remains still in their infancy. Therefore, it is not too late to explore the different opportunities in NT. In contrast to other technologies, research in NT can be conducted with inconspicuous tools such as computers and scanning probe microscopes, which are relatively inexpensive. In many cases, no unusual chemical precursors or feedstock are required. Therefore, NT becomes an attractive field for research and development in third world countries because it can be done with modest resources and relatively low funding. This is particularly true for those countries with a high educational level and an active scientific sector. However, the importance of NT for these societies is now a matter of debate that involves the scientific community (that have perceived NT opportunities) and governments. In contrast, others important actors such as the business community and societal organizations are practically absent.

There are several problems that limit the development of NT in third world countries. Firstly, scientists must convince their governments to invest in this field, a difficult task when many other relevant areas for the society, such as education and health, are in most cases un-attended. Today, the business community of these countries does not understand the meaning of NT, and therefore the opportunities underlying this activity. As a consequence, private founders, large and small companies, are still practically absent from this activity in contrast to the increasing interest in others fields such as biotechnology. Secondly, in most of those countries a critical mass to initiate research and innovation in NT is still absent, so that funding at specific high-level research centers and a strong educational effort supported by international cooperation are needed. Thirdly, governments and academic institutions should identify some specific areas that could impact national economies, and where they can compete with possibilities with the first world. This is not simple in developing countries where the link between the scientific sector, governments, and business community is weak, and in many cases, extremely difficult. This link, however, is crucial in order to concentrate the societies' efforts in an efficient way.

Progress in the first issue is now evident. Conscious of the impact of NT in modern societies, developing countries that had been early players have increased expenditure on NT. Some others have recently started coordinating initiatives aiming at the development of National Programs that could not only foster the contributions of scientists to the scientific development, but also induce domestic technological developments and the transfer of the corresponding benefit to societies. Finally, in other countries NT has now been recognized as a vacancy area that must be funded because of the importance of that field in the future development of their societies.

While many researchers in developing countries have moved from material science, surface science, biology, physics and chemistry to NT fields, with some exceptions, a critical mass to initiate serious research and development in this area is still absent. In fact, at present high-quality research in NT is made only by a few scientific groups. For instance, Latin American groups have produced only the 2 % of the total contributions presented at the last international meeting "Trends in Nanotechnology", one of the most important in this field. Despite the fact that the interest of the scientific community of these countries in NT is positive, in order to reach a critical mass, the few high-level laboratories that are active (or have real possibilities to be active) in NT should be specifically funded. International nets should incorporate active and potential active NT groups from developing countries. Projects, and post-doctoral positions in specialized NT centers as those in US, Japan and Europe are needed to build an active NT community in the third world countries. Note, however, that research and development in NT requires also changes in educational structures. In fact, the multidisciplinary nature of NT has presented the scientific community with many challenges. Industrialized countries have already modified these structures to meet NT requirements but this is not the case of third world countries.

Concerning the third issue, it must be said that while governments and many businesses are well aware of the potential benefits of NT, there is a still majority, particularly in third world, who do not understand what nanotechnology is and why it is important for societies. The major problem is how to communicate a complex technical subject developed in high-level research centers to the society in general. In fact, NT as an underlying technology is far less visible than others. The lack of communication between scientists, governments, the business sector, and the society in general, referred to directions and implications of NT, may have serious consequences including public fear and rejection of NT activities, particularly in developing countries.

It is clear that there are many fields of NT that can be identified as opportunities for developing countries. However, from the beginning, these should be based on ecologically sound and cheap manufacturing processes. For instance, self-assembly is a basically friendly and inexpensive technology, particularly attractive for serial fabrication. Self-assembly appears as a promising alternative to the one-by-one building technology that requires nano/micro-assemblers and high-technological facilities. It does not require clean room environment so that the tremendous costs associated with special building constructions, air filtering, and high energy consumption are avoided. Some specific areas where NT could contribute to the economical development and life quality in developing countries can be easily identified, particularly in the area of medicine and sustainability. For instance, the development of more efficient and cheaper portable chemical sensors based on nanostructured materials to identify water, food, and emission contaminants should be the great interests of governments and societal organizations. New biosensors based on enzymes and silicon chips for diagnosis and disease control, and nanostructured materials with enhanced biocompatibility fabricated using low-cost direct patterning methods should be of interest for small local laboratories and companies. Drug delivery by nanomicelles or implanted nanodevices could turn more efficient the treatment of diseases, reducing drug doses and toxicity, and accordingly the cost of disease treatment for society. Enzymes encapsulated into nanostructured materials that could produce drugs in a highly specific and efficient low-cost way could attract the interest of small pharmaceutical laboratories. More efficient catalysts based on nanostructured metals and oxides can help the industries to be more competitive, and also to protect the environment by eliminating pollutants, i.e. by electrochemical or photo-oxidation methods. These are only a few examples.

In conclusion NT is an opportunity for third world countries. Countries able to do efforts in

research and development in the field of these new technologies would have a chance to reduce poverty and improve the standards of living of their societies. Governments should invest in education, and in long-term, high-risk and high gain research required to create new technologies, and ensure that they are consistent with the societal objectives. A negative to be involved in these efforts would only imply deeper dependence, increasingly larger differences in the quality of life with industrialized nations, and the impossibility of participating in the discussion and control of NT directions in the world. The debate is now open, and all societal actors should participate to make a decision about the role of NT in their societies.

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Miguel Kottow: Some ethical implications of research on human beings in developing countries

Introduction

The topic of research with human beings has had three highlights in ethical discourse: Nüremberg 1947, the Belmont Report in 1978, and the 6th Helsinki Declaration issued in Edinburgh in 2000. Many other important contributions have been published, including an often quoted article by Beecher,[1] polemic articles by Angell[2] and extensive reviews by Brody.[3] Since the first Declaration (1964), Helsinki documents have been widely publicized and well received but, by the very nature of international proclamations, only erratically followed. The impact of Helsinki has been undermined by proposals to continue debate,[4] but also by dismissals like "The United States and most other countries have been ignoring the Declaration of Helsinki for years".[5] Edinburgh 2000 was preceded by heavy and unresolved controversy,[6] and followed by equally unsettling discussions and unwillingness to comply by the official text. An atmosphere of explosiveness has been created, leading to the very negative effect of continued tolerance for a double standard of research ethics, which severely affects the needs and interests of less developed countries.[7] This brings the last of the Helsinki Declarations to the unique position of being much more controversial than consensual, having unleashed an avalanche of discrepancies and proposals aimed at modifying the text to accommodate vested interests. With equal verve, the contrary positions insist on letting it stand as published in defence of research subjects from host nations.

In such a polemic atmosphere, semantics should be used with care and clarity. The euphemism "developing countries" might better be dropped, because it implies that the poorer countries are well on their way to development; their present condition seems temporary and their natural goal is to reach the status of industrialized countries. More realistically, the traditional label of "underdevelopment" agrees with statistics showing that globalization is working against international equity, while income gaps are increasing both across nations and within societies. Ethical analysis should accept that one is dealing with realities and not with expectations, and realise that hope for the future should give way to accurate assessment of the present. One of the often discussed features of poor populations in Latin America is the prevalence of hopelessness –desesperanza-, which evolves from living in a present that is destitute and resilient to change. When referring to research in developing countries, it would be a mistake to see conditions as temporary, and the fact should be faced that one is talking about scientific activities in a poor environment populated by vulnerated citizens with severely reduced empowerment.

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[1] Beecher HK. Ethics and clinical research. The New England Journal of Medicine 1966; 274: 1354-1360.

[2] Angell M. The ethics of clinical research in the Third World. New England Journal of Medicine 1997;37:847-849.

[3] Brody BA. The ethics of biomedical research. New York Oxfor, Oxford Uni. Press 1998.

[4] Macklin R. After Helsinki: Unresolved issues in international research. Kennedy Institute of Ethics Journal 2001; 11:17-36.

[5] Levine R. Quoted in Macklin (2001):22

[6] Rothman D. The SHAME of medical research. The New York Review, November 30, 2000: 60-64.

[7] Editorial: Dismantling the Helsinki Declaration. Canadian Medical Association Journal 2003; 169 (Nov. 11): 1-2.

The second preliminary point to be mentioned is, if you wish, of a Kantian nature. Bioethicists always refer to research "with" human beings whereas scientists, and the title suggested for this round-table debate is in accordance, often tend to practice research "on" human beings. This apparently trivial change of preposition is at the heart of a great part of the debate. To research with subjects implies participation where these subjects are not only means to the ends of science, but remain ends in themselves, that is, they benefit in some way from participating in a trial. To the contrary, research on human beings, like research on animals, robs subjects of any end for themselves and reduces them to be means of research goals they may not even be informed about, and where they gain no benefit at all.

Underlying these apparently excessively fine points of semantics, is a very strong current aimed at maintaining a privileged status for science and for the ethics of research, something like the aura that surrounded medicine during the 19th and great part of the 20th century. But, like medicine, science has lost much of its splendour, becoming a business enterprise with competitive strategies, where scientists do what they have to do in order to make a living, get research funds, secure tenure and gain prestige. The alleged purity of value free science should be laid aside; science and scientists must become socially responsible and ethically accountable, like any other social practice. In the biomedical disciplines, and especially when referring to research in underdeveloped countries, researchers should not be allowed to neglect their duties to participating subjects, and the excuse that "valid science" requires a pragmatic brand of ethics is not to be taken seriously.[8]

Declaration of Helsinki: Article 30

This said, I will concentrate on some of the issues that have been raised by, or in the wake of, Helsinki 2000, and this at three levels:

The first level concerns the strong movements that have ensued to modify, or defend, the Declaration. Representatives of research-strong countries consider the Declaration as it stands to be too permissive in terms of allowing demands by host countries that would soar research expenses. Cost conscious lobbyists would like to replace some Articles, especially N° 30, with a more liberal and contextual *de facto* reading that should prevail over a *de jure* commitment. This issue has prompted very active discussions, the most recent one in an international meeting in Helsinki. As could be expected, no definite decisions ensued, and both sides parted happily. Third World representatives achieved that no weakening modifications were introduced, but it would seem that sponsor countries carried the day because study groups were convened to evaluate the convenience of suggesting changes in the Declaration. That is enough to plant the seeds of doubt and to support those arguments that consider the Helsinki Document as a proclamation with little or no binding power.

On the second level, and this is not an official opinion, it does seem necessary to modify the Declaration, but in the opposite direction, hoping to reinforce the protection of research subjects. Without suggesting a specific change, I should like to present a rephrasing of article 30, not to be taken at face value but more as an illustration of what is meant by buttressing of research subjects´ rights:

Article 30 as it now stand (emphasis added): At the *conclusion* of the study, every patient entered into the study should be assured of access to the best proven prophylactic, diagnostic and therapeutic methods *identified* by the study.

[8] Miller FG & Brody H. A critique of clinical equipoise. Hastings Center Report 2003; 33:19-28. p. 27.

Article 30 as it might be formulated: All patients participating in an investigation must have the assurance that they will receive, from the *very beginning, beyond the conclusion of the trial, and as long as medically necessary*, the best preventive, diagnostic and therapeutic agents that are *proven, existent or identified by the study.*

Controversial research strategies

The third level of analysis is the most important and unfortunately least heeded one. It refers to the numerous publications and presentations that have come forth in defense of certain research strategies that purport to defend the efficacy of scientific endeavours and the need to adapt some of the most basic tenets of clinical ethics. These issues are basically: Use of placebos, equipoise, the distinction between clinical ethics and research ethics, the distinction between therapeutic and non-therapeutic clinical research, exploitation in biomedical research.

Placebos

Placebo means to please, and is used in medicine when the prescription of an inactive agent will make the patient feel better because something is being done to get him well. In clinical research, placebo is a misnomer, for no one is pleased except the investigator. For researchers, a new agent will compare most favourably against an inert control substance.

From the point of view of research subjects, the argument against the use of placebos is simple: If the replacement of an active agent with a placebo has therapeutic consequences for the subject, than this replacement is ethically not acceptable. If it is indifferent for the subject to receive the active drug or a placebo, the research protocol is probably trivial and unnecessarily puts patients at additional risks. Instead of asking whether to use placebos or not, it might be more reasonable to see what the active arm contains: Is it known to be effective? Then placebos would undertreat; is it expected to be effective? Then placebo subjects are being denied a therapeutic opportunity. Is it of minor consequences? Then the need for research should be questioned. Is it supposed to be an improvement on current therapy? Then it should be compared with this therapy. In conclusion, there is no situation in Phase III of clinical trials where placebos are in the interest of the subject, and in most instances their use would be detrimental to those interests.

Equipoise

A major distinction is made by Freedman,[9] between Fried´s theoretical equipoise regarded by the individual physician, and so called clinical equipoise where the medical community is in doubt about alternative courses of medical action; but in both cases the relevance of equipoise evaluation is confirmed for research done in the light of therapeutic uncertainty. The conclusion of a very recent review of the subject confirms theoretical and clinical equipoise together "may play a central role in our understanding of the ethics of research, and indeed, in the protection of human research subjects." [10]

Equipoise had a fairly uncontroversial life until recently, when an unsettling debate ensued with the aim of doing away with equipoise considerations altogether. There are three situations were clinical equipoise is present and important to be considered:

Alternative therapies are considered of equal value by the medical community, and may be indifferently chosen in accord with physician´s preferences. This is a sustainable form of

[9] Freedman B. Equipoise and the ethics of clinical research. New England Journal of Medicine 1987; 314:141-145.

[10] Miller PB & Weijer VC. Rehabilitating equipoise. Kennedy Institute of Ethics Journal 2003; 13:93-118 (116).

equipoise because no patients are harmed by the choice of one or the other alternatives.

Alternative therapies coexist under strong discrepancies, so that one or all preferences are wrong (they cannot all be logically right), and suggesting that one or all of them are useless and possibly harmful. Some or all patients are being poorly treated, which makes it mandatory to investigate and eliminate those therapeutic proposals that are causing harm. The therapeutic indecision is untenable and demands clarifying research: harmful equipoise.

A new agent is proposed and offered for investigation. If previous research phases show it be a potentially effective agent that will disrupt existing equipoise, a study is welcome provided it will compare the new agent with the best therapy currently existent, not against placebos. If the new agent is expected to yield only marginal improvements, such that prevailing equipoise will not be disrupted –but rather complicated by the addition of still another equivalent alternative-, the study will only be reasonable if it entails no risks to subjects, and if subjects share whatever benefits might accrue.

In sum, equipoise is a frequent clinical situation which, offering criteria that efficiently serves to protect the interests of subjects, and needs to receive close attention in the ethical analysis of research protocols.

The distinctions between clinical ethics and research ethics

A patient is an individual in need of care, protection and medical treatment. Clinical ethics sees to it that medical practice upholds the values concerned with patients´ well being. It is widely accepted that the precepts of clinical ethics ought to be impartial and indifferent to context and circumstances. Therefore, if patients are recruited to become subjects in clinical trials, it would be contrary to clinical ethics to reduce their moral entitlements by putting them on a placebo arm or subjecting them to less than best proven medical treatment in existence. Research ethics will probably include additional ethical considerations, which in no case are to be withheld, and under no circumstances will it be legitimate to substitute research for clinical ethics at the cost of best care, benefits, and moral entitlements of patients. Clinical ethics and research ethics are not equivalent. Whichever set of ethical concerns appears to be more inclusive should prevail when individuals shift from being patients to also being research subjects.

Therapeutic and non-therapeutic clinical research

Researchers prefer to make no difference between therapeutic and non-therapeutic trials, by which premise they would subject patients in need of therapy to the vagaries of double blind randomised studies, reducing their ethical concerns to informed consent and avoidance of unproportionate risks. If placebos or less than best treatment are being used in the control group, those patients falling in the inactive arm will be undertreated and unprotected. All this need not happen in non-therapeutic investigations if the patient continues to get required best medical care while being in a research protocol unrelated to his disease, but chances are that research ethics might even here tend to reduce best care. The particular ethical concern in non-therapeutic research is that the patient-subject be increasingly susceptible to inherent risks of the trial situation. Helsinki has been clear about this point in its introductory remarks: "a fundamental distinction must be recognised between medical research in which the aim is essentially diagnostic or therapeutic to the patient, and medical research, the essential object of which is purely scientific and without implying direct diagnostic or therapeutic value to the person subjected to the research." Unfortunately, investigators concerned with scientific purity have been inclined to take the opposite view.

Exploitation

A number of euphemisms are making the rounds, purporting that not all injustice is an exploitation –true-, and that not all exploitation is unjust –false-; not all exploitation is immoral –false, nor is all unethical conduct an exploitation –true-.[11] Theoretical considerations by the National Bioethics Advisory Commission (1998) describe three kinds of potential benefits for research subject: direct, indirect, and benefits for third parties.[12] Research with human beings as traditionally understood, does not contemplate any ethical requirement that subjects be in any way benefited. In fact, strong advocacy has been displayed to deny payment, compensation and reimbursements, with restrictive norms about liability for complications occurring during trials (CIOMS 2002). Thus conceived, subjects are never an end in themselves, for they are always means for third party interests. Research with human being is always research on human beings and violates Kant´s categorical moral imperative.

Subjects are invariably deprived or sick, either because a clinical trial is done with patients, or because destitute individuals from Third World countries are recruited. Deprivation robs people of their capabilities to make use of their liberty.[13] Another moral norm is violated when dependent subjects are recruited for investigation, because the deprived and dependent are not free to choose, so they unfreely enter trials that will not benefit them and which always entail risks, thus constituting a morally highly regrettable form of exploitation. The denial of benefits after termination of a trial constitutes an undeniably exploitative practice.

Conclusions

All the instances previously discussed shortshift ethical requirements of research practices, unfortunately being explicitly defended in the name of investigations done by sponsor researchers in underdeveloped host countries. This has given rise to a double standard of research ethics: aspirational and pragmatic ethics. It will not do to excuse these terms as being purely descriptive without any normative intention, for ethics is by nature prescriptive.[14] From the vantage point of impartial ethical analysis, moral precepts should aim at universalizability and avoid committing the natural fallacy of using social and economic data to mollify the rigor of ethics.

[11] Macklin R. Bioética, vulnerabilidad e protecao. In Garrafa V & Pessini L (eds.). Bioética: Poder e Injusticia. Sao Paulo, Ediçoes Loyola 2003: 59-70.
[12] Spinetti SR & Fortes PA de C. Pesquisas en saúde pública : uma breve reflexao sobre o retorno dos resultados. En Fortes PA de C & Zoboli ELCP (eds): Bioética e saúde pública. Sao Paulo, Edicoes Loyola 2003:113-123.
[13] Sen A. Development ad Freedom. New York, Alfred A. Knopf 2000
[14] Macklin (2001).

Cesar Jacoby: Report on the Brazilian Medical Association's position to the proposed revision of paragraph 30 of the World Medical Association's Declaration of Helsinki (2002) - Ethical principles for medical research involving human subjects

1. Background

The Declaration of Helsinki is the WMA's best-known policy statement. It was first adopted in 1964 and has been amended five times since, most recently in 2000. A note of clarification to paragraph 29 was added in 2002. The current (2002) version is the only official one.

At a meeting of a WMA Workgroup on the DoH held in September 2001, it was agreed that paragraph 30 was "probably unrealistic in its expectation of researchers and sponsors of research and should be changed to provide a more balanced view on the requirements of ethical research."

A workgroup appointed by the WMA Council in September 2003 reviewed paragraph 30. This paragraph lays down that "At the conclusion of a study, every patient who is part of the study should be assured of access to the best proven prophylactic, diagnostic and therapeutic methods identified by the study."

The WMA received many comments and suggestions on this paragraph, which served as background information for debate at the WMA Medical Ethics Committee and Council meetings in Helsinki, Finland, immediately prior to the WMA General Assembly, Helsinki 2003. Some are cited here not in any particular order of importance or priority.

The Pharmaceutical Research and Manufacturers of America (PhRMA), in a Discussion Paper dated June 2001, suggested new wording for paragraph 30, as follows:

"The information obtained from the study as well as cumulative knowledge of the method and the disease being studied, should be used as a foundation for the provision of long term access to the most appropriate prophylactic, diagnostic and therapeutic methods for the study population."

The justification for this proposed revision is as follows:

"From a scientific and practical perspective, it is virtually impossible to identify the so-called 'best' treatments on the basis of a single study. From a legal perspective, a research sponsor could be in conflict with local laws and regulations by promising to supply and distribute biomedical products that are not approved locally for use, or that are made and marketed by another organization. The research results should form the basis, in conjunction with other relevant information, for the eventual local approval of a therapeutic agent appropriate for the target population." and "…providing access to medicines is an obligation shared with Governments, NGOs, and others."

A critical analysis of paragraph 30 was given by Greg Koski, Director of the Office for Human Research Protections, US Department of Health and Human Services, at a Conference on the revised DoH, held in Pretoria in March 2001. It is reproduced below in full.

"A new section within the revised DoH, concerning the assurance that, at the conclusion of the study, the best proven intervention identified by that study be made available to every patient enrolled, has raised a number of serious concerns for government sponsors of research. The current version does not recognize the fact that there is often disagreement about what the 'best current prophylactic, diagnostic, and therapeutic methods' are, or that they can vary by population or geographic area. In fact, it seems to assume that the 'best method' can always be ascertained by a single clinical trial conducted in one geographic location, which is rarely the case. A single trial rarely can determine how best to prevent or treat a disease in all settings, even in the precise setting in which it was conducted."

Paragraph 30 rests on the assumption that a single clinical trial, even if 'positive', would provide certainty as to how best to prevent or treat a given disease. Good trials provide clinically relevant results. However, in order to weigh potential benefits against possible harms, consensus about prevention or treatment for any given condition requires the examination of the outcomes of that trial in the context of other clinical trials, as well as an effort to scrutinize information from related clinical and related basic and applied research efforts. The results of one study might not be expected to be sufficient to mobilize a change in health care delivery, but, in certain circumstances, could lay a foundation for such changes.

If 'proven' is taken to mean 'approved by a regulatory body', then a number of years might pass before the requisite data are submitted and reviewed and the data validated. Moreover, once determined to be efficacious in a controlled trial setting, additional studies will often be needed to test the effectiveness of the intervention in actual practice. Studies are also frequently needed to identify effective delivery mechanisms and ways to influence behaviors of the population to make prevention and treatment interventions accessible to the intended populations. What 'proven' means in the DoH context is not clear, and will likely be of little help to ethics review committees."

A section entitled "Post-trial benefits" is included in a paper by Harold Shapiro and Eric Meslin (who served as President and Executive Director respectively of the now-dissolved US National Bioethics Advisory Commission), published in the New England Journal of Medicine (2001, Vol. 345, pp. 139-141). The following are extracts from this section:

"Making a successful new intervention available to participants after a trial is an especially important ethical obligation. There is a related obligation to ensure that participants are no worse off during the trial than they were before it. In addition, we believe that research participants should not be made worse off as a result of their inability to have continued access to the successful intervention after the trial has ended. Although the researcher – participant relationship is different from the doctor – patient relationship, trust in the medical profession is central to anyone's willingness to participate in a trial. Any sense of abandonment is difficult to address adequately in the informed-consent process.

A plan for the routine provision of a successful new intervention to participants after a trial has been completed is one way to ensure that the study is responsive to the health needs of the host country."

2. Brazilian position

There is no doubt that each country should have its own set of rules related to research involving human beings and of course Brazil is no exception – however these rules ought to comply to a minimum set of principles aiming to guarantee basic human rights. The Declaration of Helsinki has provided this framework. The Brazilian Health Council Resolution 196/96 on Human Research Ethics states clearly that subjects of research must have access to the best proven medical care and also that it is

unjustifiable to discontinue treatment after the study is over until this treatment is available through the health system. It does not seem correct that the local ethical committee may decide it is ethical if the physician states explicitly "it is foreseeable or likely that the sponsors will not be able to provide effective and appropriate treatment to the patient after he or she leaves the study", as it is implied in one of the proposed amendments to paragraph 30 (item 4.2 of the WMA Secretariat Report on the Revision of paragraph 30 of the Declaration of Helsinki).

There is also no doubt that the Declaration of Helsinki is a landmark for the provision of adequate ethical standards on research involving human beings and albeit being a declaration of the World Medical Association, i.e., written by and for physicians, it has become by its own merits a possession of the whole society. Item 2.2.6 (Workgroup Report on the Revision of Paragraph 30 of the Declaration of Helsinki) leaves the impression that instead of keeping the Declaration of Helsinki in its place of visibility or respect it should be mirrored in the much more lax ethical vision of documents released by the United States National Bioethics Advisory Committee, the Nuffield Council on Bioethics or by CIOMS. Wouldn't it be expected that the other guidelines should mirror on the Declaration of Helsinki and not vice-versa? Add to this that all these cited documents were prepared by individuals or institutions from industrialized countries to be applied abroad.

One source of confusion in paragraph 30 is that it does not take into account the different phases of a clinical trial – if it is a phase I or II trial it is not possible to ascertain that the volunteers will have immediate access to the drugs (or vaccines or prophylactic methods) tested, but the negotiation for future access must be part of the initial protocol. On the other hand there should be a much more strict recommendation for such an access in the case of phase III and especially phase IV clinical trials.

There should be no double standard in clinical trials and if no economic constraints existed the best proven medical care would be a world standard and would not be discussed in a ethics document – Paragraphs 19 and 30 have the purpose of guaranteeing to the research subject access to the beneficial results of the research independently of where the research is being conducted.

Participation as a volunteer in a clinical trial presupposes a balance between burdens and benefits – there is no justification whatsoever to interrupt, after the trial is over, access to the needed care attained during the trial.

As mentioned in item 2.2.2 of the Workgroup Report on the Revision of Paragraph 30 of the Declaration of Helsinki, it is a fact that "research studies cannot substitute for an inadequate healthcare system that does not provide equal and affordable access to good and effective care for all people" and that "Neither sponsors nor researchers can take responsibility for deficiencies relating from political mistakes and global economic circumstances." One way of misinterpreting the latter is that the volunteer's problems are not the researcher's (and the sponsors') business. There is not a way of pretending that the research team is not very much responsible for the well being of the research subject and thus "Physicians conducting research must not separate their role as researcher from their role as physician" (item 2.2.5). Item 2.2.2 is misleading, as it does not distinguish the context of a controlled, limited clinical trial where it is possible to plan for the provision of the needed care for the research subjects from the context of providing care under the political and resource limitations of the local health care system.

The proclaimed and real urgency of many countries is for efficacious vaccines, drugs, preventive or diagnostic methods and not specifically for a clinical trial. Trials must be conducted with the establishment of the needed

conditions for their development. It must be taken into account that there is an indisputable obligation to protect the volunteers and if for this protection costs are incurred they should be considered as an intrinsic component of any planned trial and not as an excuse to lower the ethical standards.

According to item 2.2.3 (Workgroup Report on the Revision of Paragraph 30 of the Declaration of Helsinki) "Expecting sponsors or researchers to take that burden may inhibit worthwhile studies that direct serve the health needs of these populations." To be afraid of scaring the industry (most frequent sponsor) is, at the least, a misdirected protectionism for sponsoring companies or agencies. Very often the assertion of the inordinate costs of providing treatment for clinical trials subjects are made without any systematic attempt to actually determine those costs. There is also the affirmation that "the costs of providing continuing care would be prohibitive for independent university research that is usually done with comparatively small budgets." It is a rarity that a clinical trial with new drugs originates from independent universities with small budgets. In these unlikely situations it will be necessary to establish or look for specific funds for such an endeavor (for instance through international or national agencies and if applicable through mechanisms such as the Global Fund for AIDS, TB and Malaria).

The Brazilian Medical Association, after hearing the Brazilian Society of Bioethics, the Brazilian Ministry of Health (Science and Technology Department and National STD/AIDS Program), the Brazilian Medical Council and the Brazilian Research Ethics Commission, proposed to postpone any changes to the paragraph 30.

The Declaration of Helsinki as a landmark for the provision of adequate ethical standards on research involving human beings is considered by its own merits a possession of the whole society. As such, it deserves to be amply and thoroughly discussed when an upgrade is required. The Brazilian Medical Association advocates for the avoidance of notes of clarification, proposing that any needed modification be done only after ample and long evaluation, and not use this method to dilute the ethical requirements one paragraph at a time (as it already happened with the Paragraph 29). Suffice to say that even in a *petit comité* fashion that discussed the issue for more than a year "there was no consensus on all the issues raised and addressed in this workgroup report."

In particular, there was concern that the proposed amendment might weaken the intent and provisions of paragraph 19, which states that "Medical research is only justified if there is a reasonable likelihood that the populations in which the research is carried out stand to benefit from the results of the research." As a matter of fact, the proposed changes are in direct contradiction with paragraph 19, the mainstay of the justification for the performance of a clinical trial of the Declaration of Helsinki. Thus, the Brazilian Medical Association proposed the postponement of the decision on any modification on the paragraph 30 giving time for a longer and more beneficial debate.

3. World Medical Association General Assembly - Helsinki 2003

The WMA received many comments on this paragraph, which served as background information for a lively discussion at the WMA Medical Ethics Committee and Council meetings in Helsinki, Finland, immediately prior to the WMA General Assembly, Helsinki 2003. Council resolved to make no changes to the paragraph at this time but to continue the discussion until the next WMA General Assembly, Tokyo 2004.

The options for this discussion are as follows:

Continue the search for consensus on an amendment and/or a note of clarification. The consensus would have to include (a) a choice among an amended version of paragraph 30, a

note of clarification, or both, and (b) the precise wording of whichever of these is chosen;

Leave the wording of paragraph 30 as it is but clarify the status of the DoH as a statement of ethical principles, not laws or regulations, that includes both requirements to respect generally agreed rights of research subjects as well as goals towards which all those involved in medical research should aspire and strive;

Leave the wording of paragraph 30 as it is.

In relation to a possible amendment, the Brazilian Medical Association, the Brazilian Society of Bioethics and the Brazilian Ministry of Health maintain their clear and unequivocal opinion on this subject. Any change in the DoH should be done only if there are compelling reasons to do so. And in a unequal world as the one we live in, we argue that if a modification is to be made, it should be in the direction of making the ethical obligations of providing adequate access to medical care even more stringent, to be applied to each and every trial involving a human being, wherever such a trial is performed.

Just for the sake of this discussion, if WMA concurs that an amendment to paragraph 30 is necessary to make it stronger, it could be read as:

> *Before undertaking a study, the research team must ensure that all patients entered into the study will have access to any available prophylactic, diagnostic or therapeutic method that the study proves to be the most effective, safe and appropriate for such patients. The arrangements for the continuation of treatment beyond the study should be described in the study protocol (paragraph 13) that is submitted to the ethical review committee.*

We are against the use of Notes of Clarification, which instead of strengthening the ethical requirements just weakens them. An actual example is the Note of Clarification to paragraph 29 which was both confuse and lax. As a matter of fact this example is being used to say that the DoH is risking losing its moral authority.

In summary, the Brazilian Medical Association, the Brazilian Society of Bioethics and the Brazilian Ministry of Health advocate for the avoidance of notes of clarification, proposing that any needed amendment be done only after ample and long evaluation, and not use this method to dilute the ethical requirements one paragraph at a time.

Luiz Antonio Barreto de Castro: Resource poor countries need the advances of biological sciences to mitigate urgent social problems

When Herbert Boyer expressed the insulin gene in bacteria in 1973 I was a freshman Plant Physiology PhD student at University of California Davis. We all new knew then the world was going to change. Back to Brazil in 1977 I wanted to engineer plants but had neither money nor a laboratory. Besides not one plant had been engineered then. I was lucky to work with Maury Miranda a biophysicist at UFRJ in Rio who wanted to know what controlled the very early expression of genes to turn a fly into a fly. I tried to learn how to improve the methionin level of legume seed storage proteins, critical for the brain formation in the early infancy years. He said it was the same thing and I learned later he was right. He died prematurely and a Caltech group won the Nobel Prize answering the question he asked back in the seventies. I went back to UCLA in the eighties funded by a Biotechnology Career Fellowship from the Rockefeller Foundation, which gave me the chance to work with Robert Goldberg, a master in Plant Sciences and Molecular Biology, and learn a lot more about Developmental Biology, which my old friend Miranda unfortunately could not do. I always remember the Rockefeller Foundation with gratitude for this opportunity. I was hired by EMBRAPA in 1981 to build agricultural biotechnology at a Genetic Resources Research Center founded almost thirty years ago: CENARGEN in Brasilia, that soon became The National Research Center for Genetic Resources and Biotechnology. I have been trying to consolidate the scientific component of the agricultural biotechnology sector in Brazil during the last twenty years. At CENARGEN we can now express any gene of any organism in any other organism except in animals, but we are close. Rodolfo Rumpf announced last month his team recovered and cultured somatic cells from a genetically superior cow, dead on a accident, and from these cells he produced a bovine clone "Lenda" which, as implied, is identical to the dead mother. We have seventy biology trained PhDs at CENARGEN , who can turn the agriculture of the tropical world around through molecular genetics, genomics, proteomics and genetic engineering. They team up with the best plant molecular geneticists and plant breeder for the tropics we have at EMBRAPA and other institutions in Brazil.

This introductory background is important and intended to present on a snapshot thirty years of personal and institutional efforts devoted to genetic engineering in Brazil since its onset. It gives the dimension of the frustration we all experienced when, after the first genetically modified plant commercially was released in the US in 1995, science lost every legal battle against the Greenpeace in Brazil. The first one was in 1997, the last one in September 2003. Due to legal sentences we cannot commercially release genetically modified plants in Brazil (exceptionally the RR soybean introduced illegally in the country was allowed to be commercialized by a governmental provisional measure) and doing science is almost impossible. We have dry beans resistant to the golden mosaic virus intended for the small farmer ready to go, and waiting for three years to be experimentally tested in Brazil because the biosafety requirements by the Ministry of Environment are endless. No funding for this kind of science was made available during the last six years as consequence of the legal "moratorium". I look to the young and competent scientists I helped to educate and feel helpless. We engineered beans intended for

human nutrition, with seed proteins higher in methionin , moving a gene coding for a sulfur amino acid rich protein from the brazil nut , only to find out that some people are allergic to this brazil nut albumin . We have never released the bean and this problem remains unsolved. We could determine what in the protein causes the allergenicity and build a different gene by site directed mutagenesis or else, but funds are not available at all for this project.

Is this happening only in Brazil? Are there reasons to facilitate the success of NGO campaigns? Last September I realized that thirty years have passed since Herbert Boyer in California expressed the insulin gene in E coli, and I asked myself why the social benefits to those who really need it , derived from these thirty years of scientific advances have been so modest ? In fact what have we scientists done to modify this context during these last thirty years ? Those who went to the splendid seminar organized by Roberto Tuberosa in Bologna last May - In the Wake of the Double Helix, From the Double Helix to the Green Revolution heard the statements representing the expectations of developing countries with respect to the achievements of the gene revolution which can be translated in short as : developing countries feel excluded from it. Also heard from Dr Potrykus, he had to struggle for four years in Europe to take his vitamin A rich Golden Rice to the market, for biosafety reasons, like in Brazil inspired by the NGO campaigns; having also to strike deals with dozens of different biotech companies claiming patents on the technologies he used to create his rice. The commercial use of almost all crops produced by biotechnology even when directly intended for human consumption depend unfortunately on never ending intellectual protection rights negotiations. His biosafety crusade was equally unacceptable to say the least. The vitamin A biochemical metabolic pathway has been known for decades. The Golden Rice may not reduce drastically the mortality rate due to Vitamin A deficiency, that takes the life of one human being every 4 minutes according to the United Nations records; but it is innocuous. Why the Biosafety European System has taken so long to release this product urgently needed, not by the European population, but by the poorest in Africa in Brazil and elsewhere. The answer is obvious: because this rice was genetically engineered. The European biosafety regulation deals with plant GMOs as being intrinsically dangerous, even if innocuous as the golden rice of Ingo Potrikus. Why the same system released in a much shorter period of time, a cosmetic product: a lethal neurotoxic protein purified form the organism that causes botulism, intended, not for the poor, but to reduce wrinkles of the rich and sell 1 billion dollars in 2003? The answer is also obvious: because this product is not genetically engineered. This is immoral. Wrinkles are not lethal, Vitamin A deficiency that causes blindness is lethal.

These facts have been manipulated wisely by NGOs in Brazil , ignoring the biosafety bias and excesses and exploring politically the IP issues and potential economical abuses by the large corporations , only to move the public perception of Agricultural Biotechnology in the wrong direction in our country . In Brazil Agricultural Biotechnology means profit for three large corporations, economic menace for the Country and no benefit for the poor. These arguments caused all the losses we had in Court since 1997. As the President of the Biosafety Committee for three years we naively under estimated the NGOs campaigns because we had science with us .The fact is this issue is not scientific, it turned so political that it is unpredictable when we will see a solution on this never ending dispute between the US and Europe. This campaign is now spreading everywhere. The US Newsweek published in its September 8 edition: "The world's poorest regions of Central and West Africa could gain a lot from the gene revolution. However most work in biotech by the large corporations are directed to soybean, cotton, canola and corn; and patents are claimed from the work done by scientist like Potrikus". The New Times published a similar article in October: Genetically Modified Food and the Poor

So who is right and who is wrong? How scientists can play a role to provide a sound public perception about the gene revolution? How can we correct globally the mistakes we did in Brazil? My clear perception is that science and scientists are on the spot. We must immediately demonstrate the benefits to the poor of the advances we accumulated in biological sciences during the last three decades. We have a daring social agenda ahead of us .The World Bank revealed in a recent meeting that we will not meet our social goals for 2015 particularly reducing infant mortality rates as intended. The best we will be able to do by 2015 with the help of China and India is to reduce to 15 % the population of those who live with less than one US$ /day. Can we scientist relax and pretend we have no role to play in this context?

We in Brazil decided to start an international science based effort towards a less hungry world by means of the RENORBIO - The Northeast Biotechnology Network, a program we started this year with funds from the Ministry of Science and Technology and the support of all Science and Technology Secretariats of the nine states of the region. There are 5000 PhDs in the Northeast of Brazil and at least 3000 trained in areas related to Biological sciences. I am confident Brazil is mature to lead a project in this direction, we are doing very good science in every aspect of biology and we have the best genetics for the tropics. Gene sources are or will be soon available. With the right partners we can turn almost a century of genetics and plant breeding for the tropics and thirty years of investments in molecular biology and genetics at EMBRAPA, linked to the best breeding programs for the tropics to benefit the poorest countries. In fact we now feel responsible to take this technology to these countries no strings attached. It is easy to see how agriculture in Brazil is blooming. The only way to alleviate the hunger worldwide is building jobs and incomes. There is no better way to do that than through agriculture. Brazil hopefully will play a role in the gene revolution we never did in the green revolution. We are not overlooking other initiatives. In fact we will be joining efforts with other projects whenever possible. I believe this way we will be working with the best competence, the least duplication of efforts and at the lowest cost.

We want to focus initially three major constraints for agriculture development in the tropics that we can resolve: plants resistant to drought and plants resistant to soil aluminum toxicity. Even if the gene sources are available one cannot do it without genetic engineering. One cannot move a gene from corn resistant to aluminum to rice or wheat, that are incompatible with corn. Equally one cannot move a gene from a rice resistant to drought or from another source to wheat or corn, for the same reason. The third problem may take a little longer. We want to move the genes that allow for sugarcane to fix nitrogen from the air, with the help of a bacterium Döbereiner discovered before she died few years ago, to other grasses. She pioneered nitrogen fixation in legumes. This work is being done by Paulo Cavalcante and Adriana Hemerly. These scientists in Brazil can in the future make grasses to fix nitrogen so that poor people do not have to buy oil derived urea which pollutes the soil and the water anyway.

We need however a fast track to do that. We cannot go through the saga that Ingo Potrikus had to face battling with a number of patent holders and exhaustive biosafety demands inspired by a furor against GMOs, as Donald Kennedy qualifies in his Science Editorial of October 17; which prevented this rice to get to the market for four years even if we know that the golden rice is a safe products intended for human nutrition.

Brazil may lead through its Academy of Sciences this initiative, bringing other Academies to join us. I am trying to stimulate other scientists abroad to move in the same direction. What do we do in the mean time? We have to work and need support. Hunger is a world acute problem. The President of Brazil Lula da Silva made the first moves creating a Zero Hunger Program and a National

Center for the Semi Arid in the Northeast. Considering the urgency and global public interest of these initiatives the Semi Arid Center could benefit from an institutional recognition and/or institutional link to UNESCO. This would provide administrative flexibility to the Center particularly to handle international funds gathered worldwide. Funds are needed to apply the advances of bioscience to reduce poverty, in addition to donations that are feeding the zero hunger program, necessary, but not sufficient in the long run. We started a initiative to raise the funds needed for this effort. After eleven years since 1992 I wrote to the Rockefeller Foundation about it. Some Foundations like the Bill and Melinda Gates have a wonderful Program towards Global Health Problems. We intend to apply for funds under this initiative and the program provides this opportunity even if we are not talking about any particular disease: HIV or Malaria. Hunger and malnutrition are understood by the Program as diseases. In fact hunger kills almost twenty five thousand daily, mostly children. I initiated a dialog with the Bill and Melinda Gates Foundation. I wrote also to the Roberto Marinho Foundation in Brazil and the Syngenta Foundation abroad. I would like to stress it is imperative and urgent a global science based effort towards a less hungry world, focusing on major constraints for agriculture development in the tropics, that can be resolved by the modern biological sciences. It is not possible to accomplish this task however restricted by never ending negotiations of the intellectually protected Biotechnology and the exhaustive biosafety regulations for innocuous products intended for human nutrition. The solution for this acute problem equally cannot be oversimplified as proposed in the same Science issue mentioned above, which include amongst the 14 Grand Challenges in Global Health: to improve nutrition to promote health – Create a full range of optimal bio available nutrients *in a single staple plant species*, (I underlined it) as if people could be fed like we feed cattle. It is unbelievable how distant from the reality some sectors of the developed world are when dealing with social problems of the very poor.

Hermes Adán Nandayapa Arriaga Sierra: Ethical education for agricultural students in order to face agricultural ethical dilemmas

Introduction

Education is one of the most important activities in the world to achieve the development of human beings The relation among education and economic development in countries is evident. We are continuously living the action of learning. Nevertheless there are individuals who study and form themselves in the educative institutions all around the world. They as students have the responsibility as well as the institution to shape individuals who are committed to the social economic and political improvement of their communities and, to educate those who are competitive in their areas of specialty.

In this case the students of agriculture and related Sciences as well as many other students belong to the huge multidisciplinary demand of the society, where for example a graduated student of agronomy could work in the same project at the same time with a medicine graduated student in order to achieve the society well being.

Here in Latin America agriculture has an old history and is one of the main activities in the region not to mention that It has been a determinative factor in it According to information from the international organization called Future Harvest [12] in the past 20 years countries that have experienced rapid agricultural growth have also experienced strong economic growth. Typically a one-dollar increase in agricultural production generates almost two-and-a-half dollars in overall economic growth. A thriving agricultural system is also important because agriculture represents a large portion of developing world economies. In developing countries, typically more than half of the labor force works in agriculture.

For many of our earlier ancestors, nature where the agricultural fields are located seemed vast, chaotic, and implacable. Wild lands were full of fierce, wild animals, unpredictable storms, and other life-threatening hazards. By comparison, humans seemed frail and endangered. In recent years, however, as technological power to disrupt natural systems has increased, our view of ourselves with respect to nature has changed. We now can be the "owners" of a specie, change the course of rivers, the composition of the ground increasing the use of inorganic compounds, create vast artificial lakes, turn woodlands and grasslands into deserts and literally move mountains. Increasingly we see nature as fragmented, threatened and vulnerable [1]. But how much can we perturb nature without threatening not only our own existence but the rest of life as well?

It urges the necessity into the educative institutions like Universities to form a social responsibility conscience and also an environmental conscience in the students. It is important the education of subjects as nature respect and the development of ethical concepts related to moral an values. This paper will try to show the importance of those concepts. Because the ethical education in the University as well gives powerful tools to make decisions on several ethical dilemmas faced in the real life by graduated students.

But, what is the ethic and how is related to the environment? Desjardins says that in general environmental ethics is a systematic account of the moral relations between human beings and

their natural environment. Environmental ethics assumes that moral norms can and do govern human behavior toward the natural world. A theory of environmental ethics, then, must go on to explain what these norms are and to whom or to what humans have responsibilities and show how these responsibilities are justified.

The ethical principles governing those relations determine our duties, obligations, and responsibilities with regard to the earth's natural environmental and all the animal and plants that inhabit it.

The impact of human civilization in the contemporary world appears inescapable. According to Paul Taylor certainly it is the case that wild biotic communities are rapidly disappearing, to say nothing of the accelerating rate of extinction of whole species.[7] The effects of human culture and technology on the planetary biosphere are becoming ubiquitous. Due to the emergence of large-scale industrialization in the past century, the rise in the growth rate of human population, and the expansion of economies that stimulate and depend on high levels of consumption, our human presence is now felt throughout the earth. It is not only where we have taken over land areas to grow our food crops and to built our towns and cities that ecological changes have been brought about; the physical, chemical and biological concomitants of modern civilizations can be found everywhere.

The examples showed in the current work were compiled in order to explain the necessity of ethical education and they are mainly focused in developed countries specifically in the Mexican zone.

The increasing but ecologically and healthy damaging use of chemicals to improve yields

Pesticides are responsible for 3 million cases of severe poisoning and 220,00 deaths each year. While most pesticides are used in developed countries, most poisonings from them occur in third world countries. The majority of poisoning deaths in the third world have been due to cholinesterase-inhibiting pesticides such as OPPs. The high rate of poisonings in these countries can probably be attributed to less protection against exposure, inadequate warnings on packages, little formal education of agricultural workers, and minimal understanding of the health risks.

Chiapas Case

In a research held in Chiapas, Mexico in 1998 by Tinnoco-Ojanguren and others, it describes a study of exposure of Mexican agricultural workers to a widely used class of insecticides, the organophosphates.[10] It was showed that groups exposed to OPPs had lower concentrations of cholinesterase than those who had not been exposed. All subjects of the study were working their own land, thus needing to be efficient with time. Thus, they ate in the field. The authors also discovered a cultural aversion to wearing protective equipment because it would indicate weakness on the part of the worker. The major factor affecting pesticide exposure was not the level of technology of the farm workers, but their economic standing. The workers from the poorest communities were at greatest risk from pesticide poisoning.

Because pesticides have effects on all living things their use continues to think in both ecological and ethical questions, but what questions, those concerned with issues such as the rights of future generations to protection from long-lived chemicals and also the distribution risk of pesticides. Answering such troubling questions is becoming more and more difficult. On the other hand environmentalists claim that there are alternatives to agricultural chemicals. Indeed exist several examples of biopesticides.

Sonora Case

Several years ago, researchers at the Technological Institute of Sonora in Obregon, Mexico, showed that children in Sonora's Yaqui Valley are born with detectable concentrations of many pesticides in their blood and are exposed further through breast milk. Valley farmers apply pesticides 45 times per crop cycle, and they grow one or two crops per year. Area families also tend to use household bug sprays daily.

Heavy exposure to pesticides appears to have impaired child development in this Yaqui Indian community. In a new study, Elizabeth A. Guillette, the University of Arizona anthropologist who led the research and the Obregon team screened preschoolers for possible behavioral effects of such exposures.[5] Several tests were performed with children to determine whether exposure to pesticides has affected their development. Children who had major exposure to pesticides had less stamina, gross and fine eye-hand coordination, 30-minute recall, and drawing ability than children who had little exposure to the chemicals.

The sale of endemic vegetal species and the patenting of new species

The importance of biodiversity

It is in the South that biodiversity is at its greatest. Four-fifths of the world's biodiversity is found in the tropics and subtropics and tropical forests are known to contain at least half of all known plant and animal species. Today, farmers in the South continue to create and exploit this biodiversity, which is still central to many farming communities who rely on the large number of varieties available. For example, farmers in the Andes may cultivate up to 30 types of potatoes in one field. These different potatoes each exploit differences in the microenvironment such as soil type or altitude, and can have different useful properties such as disease resistance or good storage ability. The non-domesticated plants around farms also provide an abundance of diversity, which are used for many purposes, including food. This biodiversity continues to sustain many local livelihoods; and there is a need to continue developing and improving this biodiversity through diverse agro-ecosystems. Srivastava et al in a World Bank study from 1996 say about the relation of biodiversity and agriculture:

"How agriculture is transformed and intensified in a sustainable manner will be the key to how many species and how much genetic variation is still around in the next century. A focus on conserving biodiversity in 'protected areas' alone will not work. Agriculture and biodiversity are intimately connected; one cannot survive without the other. Continued progress in raising and sustaining agricultural yields hinges on better protecting and harnessing the planet's biological niches" [6]

Biodiversity in Mexico

Mexico owes part of its mega-diverse character to its geographic diversity, varying climates and geological complexity. Additionally, it's role as a species bridge between North and South America also contributes to its biological wealth. Geographically, Mexico functions as a transition zone between two distinct regions: the neo-tropical (South and Central America) and the neoarctic (North America). For example, Mexico contains 34 of 36 identifiable ecoclimates, while the continental 48 states of the US has only 4. Out of 28 categories of recognized soils, Mexico is home to 25. Though Mexico contains only 1.3% of the world's landmass, it contains 14.4% of all living species in the world. Mexico has a large number of endemic species, and is the region of origin for some 118 plant species, including maize. Because of Mexico's, and especially Chiapas', mega-diverse character, it has become a frequent target for bioprospectors.

Bioprospecting and biopiracy

The following 4 cases studies by Global Exchange, an international human rights organization, demonstrate the threat posed to indigenous cultures and livelihood by bioprospecting and biopiracy ventures in Mexico.[11]

In 1994, POD-NERS, a Colorado based seed company, purchased yellow bean seeds in Sonora Mexico. Two years later, the company president, Larry Proctor, filed for and won an exclusive patent (US #5984079) for the bean seed dubbed *Enola* and proceeded to sue two Mexican food producers—*Productos Verde Valle* and Tutuli Produce—that were selling yellow beans in the US. Mr. Proctor claimed that the two Mexican companies' commercial activities were an infringement upon his patent. The patent is currently being challenged by International Center for Tropical Agriculture (CIAT) and remains pending until the US Patent Office issues a ruling.

Pozol is a traditional drink derived from fermented corn that Mayan peoples have used for generations, both for its nutritional value as well as its medicinal properties as a natural preventative for giardia, amoebas and other intestinal ailments. In 1999 the Dutch corporation Quest International and University of Minnesota jointly obtained a patent (US #5919695) and claim, in a classic example of genetic reductionism, not to have patented the pozol itself, but rather an isolated microorganism (or active component) which the drink contains. In presenting this argument they refuse to recognize the indigenous knowledge used to develop pozol.

In 1998, the San Diego based biotechnology corporation, Diversa, signed a contract with the National Autonomous University of Mexico (UNAM) granting Diversa access to Mexico's national parks for the purpose of bioprospecting. This access was ceded in exchange for the donation of research equipment, $50 payments per sample collected and royalties of 0.5% and 0.3% resulting from pharmaceutical and chemical sales, respectively, to be used for reinvestment in the extraction zones. In contrast, Diversa agreed to pay the US Department of the Interior 10% in royalties for bioprospecting projects in Yellowstone National Park. In late 2000, the Mexican Attorney General for Environmental Protection suspended the UNAM Diversa project on the basis that UNAM lacked the authority to grant access to genetic resources, rendering the contract illegal.

Maya-International Cooperative Biodiversity Group **(**Maya-ICBG**)** is a US government program, financed through public funds, involving Molecular Nature Ltd (a Welsh biotechnology corporation,) the University of Georgia and the Mexican Southern Frontier College (ECOSUR.) Initiated in 1998, Maya-ICBG's stated goals are drug discovery, pharmaceutical development, conservation, sustainable use of ethno-botanical knowledge and sustainable economic development. Despite its promotion as a groundbreaking project in relation to PIC, various irregularities regarding just distribution of benefits, the procedures for obtaining PIC, and community representation and participation have generated strong local resistance to the project and its international censure. Compounded with the tense political situation in Chiapas, these issues have exacerbated existing conflicts and generated a climate of increased discordance.

The Council of Indigenous Traditional Doctors and Midwives from Chiapas (COMPITCH) a coalition of 12 traditional medicine organizations with grass roots support in almost 3,000 communities, has been successful in suspending the project—calling for an "active moratorium" until Mexican society, and particularly affected indigenous communities, have been adequately informed about the project. Additional stipulations for resumption of the project are passage of appropriate bioprospecting legislation and the existence of appropriate socio-political

conditions, namely an end to the low-intensity war, for such a project in Chiapas.

In September 2000 Maya-ICBG was denied permission by the Mexican government to continue its bioprospecting activities; however, team members have remained in Chiapas in an attempt to revive the project. Regardless of the outcome, COMPITCH's resistance to Maya-ICBG is a clear example of effective grass roots resistance.

Biopiracy is certainly a problem in development countries but, why don't indigenous peoples patent traditional knowledge and products themselves?. Traditional knowledge is vital to the commercialization of life products and processes. While only one specimen in a collection of 10,000 random samples has identifiable commercial use, consultation with indigenous peoples doubles this success rate (i.e., to 1 in 5,000). However, the concept of indigenous peoples patenting their own knowledge, resources and products is virtually non-existent. Two key factors inhibit indigenous peoples' use of patents: extremely high costs and, more significantly, cultural values. For indigenous peoples whose traditional values and lifestyle are rooted in communal living, shared resources, and the interdependence of all living things, patenting life is an anathema to the very value system upon which their culture is based. Are Patents only a tool of western societies? Do they reflect values of private ownership and the pursuit of wealth, which are not paramount in indigenous cultures?

According to an analysis of biopiracy legal perspectives made by Michael A. Gollin, legal tools are being developed whereby developing countries and other biodiversity rich countries may exert greater leverage over the use of their resources. This leverage can be used to earn revenues, promote conservation, and train and educate biochemists. However, the required legal tools (legislation, agreements, and court action) are sophisticated and difficult to employ. It has been far easier to engage in political, economical, technological, and ethical debates than to find legal frameworks for action. [9]

Nonetheless, given the growing legal and practical risks, many organizations have concluded that it is wise to enter into an access and benefit-sharing agreement for every collection. Gollin continues mentioning that corporations have recognized that adherence to principles of sustainable development, including the use of ABAs for natural product research, brings significant benefits to the company. Why are companies following the new rules? By doing so, they can:

Improve the reliability and quality of the material supplied to them benefit from access to traditional knowledge about plants and insects.

Establish good, which will be able to pay off in present or future markets for the company's products distinguish themselves from less green competitors, thus obtaining a competitive advantage.

The true risk to natural product research is not that the greenhouse door will be shut, thus reducing supply, or that demand for natural products will cease. Rather, the risk is that supply will drop because species are disappearing faster than we can protect and study them. To quote E. O. Wilson, "useful products cannot be harvested from extinct species." The most fundamental risk to natural products research is continued loss of biodiversity. If the new rules for biodiversity prospecting succeed in reducing biodiversity loss, while allowing research to continue, then any inconvenience they bring will be justified.

The role of biotechnology: Should we alter the genetic structure of our environment in the name of utility and profit?

Historically, research to increase agricultural production and to improve nutritional quality of plant foods has been limited because of a lack of appropriate tools to pursue such goals. The application of recombinant DNA technology to

agriculture is a natural extension of, and has revolutionized, traditional agricultural practices.

In a discussion about potential use for improvement of human nutrition Lyn Yan research says that working with the genomes of microorganisms and plants has allowed the development of lines with advantages that are not offered by conventional crops, for example, disease-resistant, herbicide-tolerant, and insect-resistant varieties. Adoption of genetically engineered crops by farmers significantly increases agricultural production and at the same time provides benefits to maintaining and improving the environment, for example, by facilitating reduced tillage cropping systems that can help reduce erosion and also reducing the use of pesticides.

In other hand acording to Clive James, chairman and founder of ISAAA. (International Service for the Acquisitions of Agri-biotech Applications) "Bt cotton alone is estimated to eliminate the need for 33,000 tons of insecticide globally, or 40 percent of the current global use." Mr. James adds that in the US, six biotech crops planted in 2001 reduced pesticide use by 23,000 tons.

Improving the nutritional composition of plant foods is one major objective of plant biotechnology. This could be particularly important to developing countries where malnutrition or nutrient deficiency is prevalent. Many international institutions and even transnational companies say that the transgenic crops have the potential to contribute to increased production and food quality, environmental well-being and human health. According to studies from the World Bank efforts to improve the rice yield in Asia through biotechnology will result in a production increase of 10 to 25 percent over the next ten years.

In other hand, growing acceptance of GM seeds as alternatives to crop protection chemicals is revealed by the increase in the acreage of biotech crops worldwide last year. According to a study from the International Service for the Acquisitions of Agri-biotech Applications (ISAAA), farmers worldwide adopted biotech crops at a double-digit pace, with 2002 global biotech acreage reaching 145 million acres, a 12 percent increase from 2001.

On the one hand, agronomists often argue that the phenotypes of transgenic cultivars are similar to phenotypes that can be selected using traditional breeding methods and that these crops are therefore not inherently unfamiliar or risky. In contrast, some ecologists insist that access to unlimited numbers of useful genes from unrelated organisms makes genetic engineering a new and potentially dangerous technique. Their major concerns are that widespread cultivation of some transgenic crops could speed the evolution of undesirable weeds or pesticide-resistant insects. To a large extent, these risks apply to traditionally bred crops as well, but the imminent release of transgenic plants has focused attention on this new technology and its potential consequences.

The new tools of biotechnology give us more power to make positive or negative impacts on the environment than was the case with conventional plant breeding technologies using during Green Revolution. Thus is essential that we review critically the potential problems that have been raised by scientific and environmentalists

Possible problems

The diversity of transgenic plants that are currently being developed and also the possible ecological risks was described in a work held by Allison Snow a research scientist at the University of Michigan Biological Station and Pedro Palma a doctoral candidate of the Department of Plant Biology, Ohio State University. [6] Some of the results are as following:.

Herbicide tolerance is a useful selectable marker as well as a trait of huge economic value to the agribusiness industry. Before the use of

recombinant DNA methods, strong artificial selection sometimes resulted in herbicide tolerant cultivars in various species. Now, however, it is possible to choose from a variety of herbicides to create herbicide-tolerant crops. These efforts will allow nonpersistent herbicides (e.g., glyphosate) to be used more widely and will permit postemergence spraying of herbicide-resistant crops. On the negative side, transgenes for herbicide tolerance could promote greater reliance on herbicides and allow crops to be grown in soil contaminated with hazardous herbicides such as sulfonylurea.

The need for alternatives to ineffective and/or toxic chemicals that are used against agricultural pests has stimulated much research on plant-produced pesticides. To date, the most common strategy is to insert various forms of the endotoxin gene from Bt into a plant's genome. Bt toxins act by damaging the membrane of the herbivore's midgut, causing massive water uptake. A single feeding event usually causes paralysis and death in susceptible herbivores (Bt toxins have no effect on humans or other vertebrates). Purified Bt toxins are used as externally applied insecticides and are popular with organic growers. However, these biological toxins break down quickly, especially in rainy weather. Now, however, constant high-dose protection is possible with transgenic plants, and the deployment of Bt is expected to become far more widespread.

Resistance to viral, bacterial, and fungal diseases has been achieved in several transgenic cultivars. In the case of viruses, genes coding for viral coat proteins can be inserted into the cultivar's genome, often resulting in "immunity" to specific viral pathogens. For reasons that are not fully understood, the expression of low levels of a viral coat protein in the plant prevents disease symptoms from developing. Many viruses infect a range of host species, so the same coat protein gene can be transferred to several species. However, a given coat protein is only effective against one virus or its close relatives, so different genetic constructs are needed to ensure protection against different pathogens.

Conclusions

Future generations of people have as much right to live a physically secure and healthy life as those of the present generation. Each of us is therefore under an obligation not to allow the natural environment to deteriorate to such an extent that the survival and well being of later human inhabitants of the earth are jeopardized. We also have a duty to know and to act ethically; the duty to conserve natural resources so that future generations will be able to enjoy their fair share of benefits derived those resources. The presence of situations as increasing of pesticides use no matter the impact on the environment, the actual danger on the fragile biodiversity and the role of biotechnology on agricultural sector are just a few examples of the common ethical dilemmas that an agricultural student is going to face. It would be unfair of us to destroy the world's natural wonders and leave only ugly trash heaps for others to contemplate. Paul Taylor wisely ask:

"How should human culture fit into the order of nature?" is not a question of biological fact. It is a question that confronts humans as moral agents, not as biological organisms, since it ask which way of relating ourselves to nature, among the various alternatives open to our choice, is the ethically right one to adopt".

Human civilization is to be taken as the total set of cultures on earth at any given time. In an ethically ideal world where all cultures are in harmony with nature, it is understood that each carries on its way of life as Paul Taylor says *within the constrains of the human ethics of respect for persons*. Thus in each community, individuals and organizations pursue their varying interests without violating each other's moral rights. At the same time they are bound by the laws and directives of legal and political systems that make their rights secure. To promote the mutual

understanding between each other in our level among agricultural students is a way to achieve this behavior. However varied may be their beliefs about reality whatever might be the understanding of the meaning of their history and traditions, whatever religious beliefs they might accept, and however they might conceive of the kinds of life most worth living, their beliefs and values do not conflict with the fundamental moral attitude of respect for persons and for the environment.

Finally in order to clarify the meaning of this work our ethical behaviour towards the earth implies that ethical holism, extending direct ethical consideration to ecological wholes, can come about only when humans change their attitudes toward the land, only when humans come to love, respect and admire the land will they have reasons to act in ways that benefit it. The thinking of Aldo Leopold is clear "It is inconceivable to me that an ethical relation to land can exist without love, respect and admiration for land, and a high regard for its value. By value, I of course mean something far broader than economic value; I mean value in the philosophical sense." [2]

And humans will come to love, respect, and admire the land learning the relations between them and the environment, here the University has a main role to play. Teaching ecology, ethics, values, environmental philosophy

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Joana Cruz: Environment and health: Ethics in pharmacy

Background

Every single pharmacists' action is an ethical decision: most are internalised and without conflict. Some are problems due to the lack of communication, psychological or social artifacts and a few others are real dilemmas.

During the last years, pharmaceutical education *curricula* underwent many modifications for a variety of reasons. In spite of these changes, ethics education has not received adequate attention in pharmacy schools throughout the world.

There is an emerging need of introducing pharmacy ethics teaching as a consequence of several social and scientific processes:
Nowadays, patients emphasize not only the need for health but also the need for quality of life. Patients expect from the health care provider professionalism, effectiveness and quality, along with devotion and empathy.
Medical technology has created new dilemmas (e.g. euthanasia, intensive care, medical genetics, biotechnology), while at the same time makes previous ethical resolutions obsolete.

Growing social concern, suspicion and demand for closer inspection on pharmaceutical activities is filling this gap. This demand is materialized in the form of increased health-related legislation, legal frameworks and new obligations for the pharmacist.

The inadequancy of nowadays bioethics' education

Formal bioethics has not effectively facilitated the process of reflective debate. Insofar as bioethics education has been a formal school-based project, it has been primarily a concern of bioethicists who are mainly academic professionals from various related fields of specialization. Many of these teachers have gains expertise from formal academic training and also been expected to transmit such expertise to their students in a formal academic environment. However, it isn't very easy to reconciliate this situation with the need to deal with the more practical and everyday aspects of bioethics. Bioethics in theory needs to be tested in practice. To be of significant practical import, bioethics needs to be able to give, students and pharmacists, guidance in practical situations. As students, and as teachers, are we willing to explore the "other"? Are we so committed to a particular perspective that we are unwilling or just unable to enter an empathic and compassionate exploration of differences? Do we fail to appreciate uncertainty, to hear each aspect of the story, to appreciate the many interests that challenge ethical conduct?

Working environment: Pharmacists interaction with their patients

The relevance of everyday ethics

Common ethical concerns occur in the communitarian pharmacy and are often the most intense stress for the pharmacist that repeatedly finds ethical problems in his work. It affords experienced and new practitioners the opportunity to explore the template of actions

that will be stressed repeatedly. For instance: "How far should I go to convince a resistant patient to ambulate?", "What should I do about a patient who refuses appropriate insulin?", "What are my limits, as a health-care provider, in respecting religious believes that I believe are harming the patient?".

Professional ethics in communitarian pharmacy

Pharmacy profession is slowly improving its clinical role in healthcare. Therefore, practice standards are changing and the public expectations are getting bigger along with the respect to professional knowledge, competency and expertise in pharmacy. Patient-centred medication management and interprofessional communication are the root of the new and reshaped pharmacist role.

The main outcome of this professional concept revolution is the escalating responsibilities added to the pharmacist, both in law and in ethical behavior. Ethical principles are regarded as precursors of law and are of particular importance in healthcare professions due to the implications of professional behavior on other humans' lives and well-being. While legal issues are usually well defined and thus become part of the required practice standards, ethical issues are not so clear.

In light of these developments, the profession of pharmacy is taking a particular interest in professional ethics. This is in response to increased interest in ethical issues in healthcare demonstrated by the public and the media, against a backdrop of an increasingly litigious community.

As a consequence of the patients rights' movement and subsequent increased consumer awareness, the traditional base of healthcare which previously dictated that treatment was to be carried out in relative isolation (treating the body not the human being) has been overturned into a very different, in practice. The patient now has the rights to decide, to ask questions, to be provided with information, to refuse treatment. The patient is entitled to complete respect for his/her total autonomy by all the healthcare professionals. Consequently, there is now a heightened awareness worldwide across all healthcare professions of the ethical debates revolving around the patient.

The standards of practice in healthcare professions, including pharmacy, have had to change to embrace these new patient-centered principles of ethics. The impact of these developments on pharmacy practice is the enhanced responsibility associated with the further involvement in patient care. The nature of the relationship between the pharmacist and the patient implies greater ethical responsibility, in line with the increased expectations of the patient. The future pharmacist is expected to give greater care and expertise than ever before.

Universities should emphasize the "third assignment", along with research and teaching, on their mission. They should promote ethics education, foster multisectorial pharmacy-related debate classes and implement problem based learning methods regarding actual ethical dilemmas.

Ethics, a look at our future professional life: How do we make the right decisions in daily pharmacy practice?

The decision making process it's a reminder to slow down and deliberate to consider the consequences, the constituencies and the options before making the responsible choice. The main steps to follow are: identify the facts; moral parameters; legal constrains and human values.

The decision maker should then identify the options, recognize implications and…Make the decision!

According to nowadays practice life at pharmacy level, the core *curriculum* for pharmaceutical ethics

and law should include, in order preparing students as future health care professionals:

Informed consent and refusal of treatment: Why respect for autonomy is so important; adequate information; treatment without consent; competence; battery and negligence.

The clinical relationship; truthfulness, trust and good communication: Ethical limits of paternalism; building trust; honesty; courage and other virtues in clinical practice; narrative and the importance of communication skills.

Confidentiality: Clinical importance of privacy; compulsory and discretionary disclosure; public v private interests.

Medical research: Ethical and legal tensions in doing medical research on patients, human volunteers and animals; the need for effective regulation

Human reproduction: Ethical and legal status of the embryo/fetus; assisted conception; abortion; including prenatal screening.

The new genetics: Treating the abnormal v improving the normal; debates about the ethical boundaries of and the need to regulate genetic therapy and research.

Children: Ethical and legal significance of age to consent to treatment; dealing with parental/child/clinician conflict; child abuse.

Mental disorders and disabilities: Ethical and legal justifications for detention and treatment without consent; conflicts of interests between patient, family and the community.

Life, death, dying and killing: The duty of care and ethical justifications for non-provision of life prolonging treatment and the provision of potentially life shortening palliatives; transplantation; death certification and the coroner's court.

Vulnerabilities created by the duties of pharmacists and pharmacy students: Public expectations of pharmacy; the need for teamwork; the health of doctors and students in relation to professional performance; responding appropriately to clinical mistakes.

Resource allocation: Ethical debates about "rationing" and the fair and just distribution of scarce health care; the relevance of needs, rights, utility, efficiency, desert and autonomy to theories of equitable health care; boundaries of responsibility of individuals for their own health.

Rights: What rights are and their links with moral and professional duties; the importance of the concept of rights, including human rights, for good pharmaceutical practice.

Ethical dilemmas at communitary pharmacy level

Two of the main issues that can raise ethical dilemmas at a communitarian pharmacy level are: the patient information and confidentiality and the consent and refusal of treatment:

Patient information and confidentiality

Confidentiality can be considered from a number of different ethical perspectives.

Respect for patient autonomy (deontological theory)

The principle of respect for patient autonomy acknowledges the right of a patient to have control over his or her own life – and this would include the right to decide who should have access to his/her personal information. Can there be a breach of confidentiality if a patient never knows that the healthcare professional has disclosed the information? Where the basis for the duty of confidentiality is the principle of respect for autonomy any breach of confidentiality means that the patient's autonomy has not been

respected, whether or not the patient is aware of the breach.

Implied promise

The pharmacist-patient relationship could be seen as having elements of an implied contract and this could include an implied promise that health professionals keep information about their patients confidential. It is reasonable for patients to expect that information they divulge to their pharmacists will be kept confidential. If confidentiality is subsequently breached the patient may feel that a promise has been broken. This view of confidentiality is different from that of patient autonomy because it depends on the concept of the pharmacist-patient relationship rather than what the patient wants or believes.

Virtue ethics

Virtue ethics focuses on the position of the pharmacist rather than that of the patient (as is the case with respect for autonomy). This approach asks what a virtuous pharmacist would do in the particular circumstances - what issues would he/she take into account in deciding whether or not to disclose confidential information?

Consequentialism

From a consequentialist position the question of whether it is wrong to breach confidentiality is determined by the consequences of the breach. One of the consequences of a breach of confidentiality could be that the patient will lose trust in his/her pharmacist, and perhaps pharmacists generally, resulting in him/her not accessing healthcare in the future with a detrimental effect on his/her (and others?) health. On the other hand there may be situations where there are bad consequences of not breaching confidentiality, for example third parties may be denied information that would have serious implications for their health and treatment.

Consent and refusal of treatment. Respect for autonomy

The principle of respect for autonomy underpins the requirement for valid consent to treatment. This principle acknowledges the right of a person to determine how his or her life should be lived and to make choices that are consistent with his/her life's plan.

Autonomy is not all or nothing. Very few of us are able to make fully autonomous choices all the time. Some of us, in certain situations, will not have the ability to understand and evaluate the options in order to make a choice. The more complex the choice and the more impaired our ability to understand, the less we are likely to be able to make an autonomous decision. This has implications for respecting autonomy in the context of health care, specifically in consent to treatment. First, pharmacists have an obligation to endeavour to enhance autonomy and facilitate the likelihood of a patient being able to make an autonomous decision. Second, where a patient is unable to make an autonomous decision, it is the duty of the pharmacist to act in the patient's best interests. However, even in these situations, an effort should be made to discover any previous preferences of the patient, or current wishes, in order to respect his/her autonomy as far as possible.

Rationality, competence and autonomy

Does an autonomous decision have to be rational? However this internal rationality may not be viewed as rational by an external view. A pharmacist may judge the rationality of a patient's decision by its consistency with the professional's view of what would be in the best interests of the patient. A decision that is seen as contrary to the patient's best interests may be interpreted as irrational by pharmacist and therefore the patient may be seen, erroneously, as not competent to make an autonomous choice. It is the internal rather than the external rationality that is

important here. A patient is not necessarily incompetent simply because he/she doesn't agree with the pharmacist about the suggested treatment. A good example of this is the case of a Jehovah's Witness who refuses a life saving blood transfusion. The decision appears irrational to the health care professional but is internally consistent with the beliefs of the patient.

Beneficence and best interests

The principle of beneficence highlights the moral importance of doing good to others. When a patient is unable to make an autonomous choice the pharmacist has a duty of beneficence. Beneficence is usually considered to rely on an objective view of what would be best for the patient whereas respect for autonomy identifies what the patient subjectively considers to be in his/her best interests.

The concept of 'best interests' is linked to well-being / beneficence but includes considerations wider than purely medical risks and benefits such as the religious and cultural interests of the patient. This implies a duty to discover if possible what the patient would have wanted or what is likely to be appropriate in the context of this patient's particular life. Thus respecting the patient as an individual person (or respecting his/her autonomy) is an intrinsic part of the process of determining best interests.

There is generally no conflict between beneficence and the principle of respect for autonomy - most patients would choose the course of treatment that is objectively considered to be in his/her best interests. However difficulties arise where the view of a competent adult patient as to what is in his/her best interests conflicts with medical opinion - for example where a Jehovah's Witness patient refuses treatment using blood products. The principle of respect for patient autonomy overrides the principle of beneficence. If the patient is unconscious then knowledge of what he/she would have wanted in the circumstances is part of the assessment of what is in his/her best interests.

World environment: Rainforests, pharmacy to the planet

Pharmacy has also had other challenges to its traditional "supply" role. Pharmacy students should be aware of the socio-economical context of drug investigation and development process, as well as its impact on today's' world life.

Pharmacy *curricula* must be re-designed in order to include multisectorial pharmacy-related debate classes and sensibilise and focus two primary values for their students:

- *An internalised concept of respect*. A personally meaningful integration of what it means to behave ethically;
- *World and self-knowledge*. We must become aware of the pharmacy world global reality, of our own values, beliefs and prejudices that influence our decisions, our approach to the dilemmas, and our attitudes towards patients and colleagues.

It is estimated that nearly half of the world's estimated 10 million species of plants, animals and microorganisms will be destroyed or severely threatened over the next quarter century due to Rainforest deforestation. Harvard's Pulitzer Prize-winning biologist, Edward O. Wilson, states that we are losing 137 plants, animal and insect species every single day. That's 50,000 species a year! Again, why should we be concerned about the destruction of "distant" tropical rain forests? Because rain forest plants are complex chemical storehouses that contain many undiscovered biodynamic compounds with unrealized potential for use in modern medicine. We can gain access to these materials only it we study and conserve the species that contain them. Rainforests currently provide sources providing one-fourth of today's medicines, and 70% of the plants found to have anti-cancer properties are found only in the rainforest. The Rainforest and it's immense

undiscovered biodiversity holds the key to unlocking tomorrow's cures for devastating diseases. How many cures to devastating disease have we already lost?

Two drugs obtained from a rainforest plant known as the Madagascar periwinkle, now extinct in the wild due to deforestation of the Madagascar rainforest, has increased the chances of survival for children with leukemia from 20 percent to 80 percent. What if we failed to discover this one important plant among millions before it was extinct due to man's destruction? When our remaining rainforests are gone, the rare plants, animals will be lost forever and so will their possible cures to diseases like cancer.

The U.S. National Cancer Institute has identified over 3,000 plants that are active against cancer cells, and 70% of these plants are found only in the rainforest. Today, over 25% of the active ingredients in today's cancer-fighting drugs come from organisms found only in the Rainforest. Among the thousands of species of rainforest plants that have not been analysed, are many more thousands of unknown plant chemicals, many of which have evolved to protect the plants from pathogens. These plant chemicals may well help us in our own constant struggle with constantly evolving pathogens such as evolving bacteria-resistant pathogens in tuberculosis, measles, and HIV. Some experts now believe that if there is a cure for cancer and even AIDS, it will probably be found in the rainforest.

In 1983, there were no U.S. pharmaceutical manufacturers involved in research programs to discover new drugs or cures from plants. Today, over 100 pharmaceutical companies and several branches of the US government, including giants like Merck, Abbott, Bristol-Myers Squibb, Eli Lilly, Monsanto, SmithKline Beecham and the National Cancer Institute are engaged in plant-based research projects for possible drugs and cures for viruses, infections, cancer and AIDS. Most of this research is currently taking place in the rainforest in an industry that is now called "bio-prospecting." This new pharmacological industry has sprung up, drawing together an unlikely confederacy: plant-collectors and anthropologists; ecologists and conservationists; natural product companies and nutritional supplement manufacturers, AIDS and cancer researchers; executives in the world's largest drug companies, and native indigenous shamans. They are part of a radical experiment - to preserve the world's rainforests by showing how much more valuable they are standing than cut down. And it is a race against a clock whose every tick means another acre of charred forest. Yet it is also a race that pits one explorer against another, for those who score the first big hit in chemical bio-prospecting will secure wealth and a piece of scientific immortality.

Since unfortunately wealth and technology are as concentrated in the North as biodiversity and poverty are in the South, the question of equity is particularly hard to answer in ways that satisfy everyone with a stake in the outcome. The interests of bioprospecting corporations are not the same as those of people who live in a biodiversity "hot spot," many of them barely eking out a living. As the search for wild species whose genes can yield new medicines and better crops gathers momentum, these rich habitats also sport more and more bio-prospectors. Like the nineteenth-century California gold rush, this "gene rush" could wreak havoc on ecosystems and the people living in or near them. Done properly, however, bioprospecting can bolster both economic and conservation goals while underpinning the medical and agricultural advances needed to combat disease and sustain growing populations.

The majority of our current plant-derived drugs were discovered through these traditional uses of plants by the indigenous people where they grew and flourished. History has shown that the rainforest is no different, and these bioprospectors now are working side by side with rainforest tribal shamans and herbal healers to learn the wealth of their plant knowledge and

many uses of indigenous plants where drugs and pharmacies are virtually unknown.

Unlocking the secrets of the rainforest

Laboratory syntheses of new medicines is increasingly costly and not as fruitful as companies would like. In the words of one major drug company: "Scientists may be able to make any molecule they can imagine on a computer, but Mother Nature...is an infinitely more ingenuous and exciting chemist." Scientists have developed new technologies to assess the chemical makeup of plants and they realise using medicinal plants identified by Indians makes research more efficient and less expensive. With these new trends, drug development has actually returned to its roots - traditional medicine. It is now understood by bioprospectors that tribal people of the rainforest represent the key to finding new and useful tropical forest plants. The degree to which they understand and are able to use this diversity in a sustainable way is astounding. The Barasan Indians of Amazonian Columbia can identify all of the tree species in their territory without having to refer to the fruit or flowers, a feat that no university-trained botanist is able to accomplish! A single Amazonian tribe of Indians may use over 200 species of plants for medicinal purposes alone.

Since Amazonian Indians are often the only ones who know both the properties of these plants and how they can best be used, their knowledge is now being considered an essential component of all efforts to conserve and develop the rainforest. Since failure to document this lore would represent a tremendous economic and scientific loss to the industrialized world, the bioprospectors are now are working side by side with the rainforest tribal shamans and herbal healers to learn the wealth of their plant knowledge. But bioprospecting has a dark side. Indian knowledge that has resisted the pressure of "modernization" is being used by bioprospectors who, like oil companies and loggers destroying the forests, threaten to leave no benefits behind them.

It is a noble idea, the ethnobotanist who works with the Indians seeking a cure for cancer or even AIDS. Yet, behind this lurks a system that, at its worst, steals the Indian knowledge to benefit CEOs, stockholders and academic careers and reputations. The real goal of these powerful bio-prospectors is to target novel and active phytochemicals with medical applications, synthesise them in a laboratory and have them patented for subsequent drug manufacture and resulting profits. In this process, many active and beneficial plants have been found in the Shaman's medicine chest, but have been discarded when it was found that the active ingredients of the plant numbered too many to be synthesized into a patentable drug cost effectively. It doesn't matter how active or beneficial the plant was or how long the FDA process might take to patent and approve the new drug - if the bioprospector can't capitalize on it - the public will rarely hear about a newly discovered plant's benefits. The fact is, there is a lot of money at stake.

While the Indigenous Indian shamans go about their daily lives caring for the well being of their tribe, thousands of miles away in US and European laboratories, the Shaman's rainforest medicines are being tested, synthesized, patented and submitted for approval. Soon children with viral infections, adults with herpes, cancer patients and many others may benefit from new medicines from the Amazon Rainforest. But what will the Indigenous Tribes see of these wonderful new medicines? As corporations rush to patent indigenous medicinal knowledge, the originating Indigenous communities have received few, if any benefits.

The possible solution: Profits without plunder

The problem and the solution of the destruction of the rainforest are both economic. Governments need money to service their debts,

squatters and settlers need money to feed their families, and companies need to make profits. The simple fact is that the rainforest is being destroyed for the income and profits it yields - however fleeting. Money still makes the world go around... even in South America and even in the rainforest.

But this also means that if landowners, governments and those living in the rainforest today were given a viable economic reason NOT to destroy the rainforest, it could and would be saved. And this viable economic alternative DOES exist and it is working today. Many organizations have demonstrated that if the medicinal plants, fruits, nuts, oils and other resources like rubber, chocolate and chiclets (used to make chewing gums), were harvested in a sustainable way, rainforest land has much more economic value today and more long term income and profits than if just timber were harvested or if it were burned down for cattle or farming operations.

This is no longer a theory. It is a fact and it is being implemented today. Just as importantly, to wild-harvest the wealth of sustainable rainforest resources effectively, local people and indigenous tribes must be employed. Today, entire communities and tribes earn 5 to 10 times more money in wild harvesting medicinal plants, fruits, nuts and oils than they can earn by chopping down the forest for subsistence crops. This much needed income source creates the awareness and economic incentive for this population in the rainforest to protect and preserve the forests for long term profits for themselves and their children and is an important solution in saving the rainforest from destruction.

When the timber is harvested for short term gain and profits, the medicinal plants, nuts, oils and other important sustainable resources which thrive in this delicate ecosystem are destroyed. The real solution to saving the rainforest is to make them see the forest AND the trees by creating a consumer demand and consumer markets for these sustainable rainforest products

This is the only possible solution that makes a real impact and it can make a real difference. Each and every person can take a part in this solution by helping to create this consumer market and demand for sustainable rainforest products. By purchasing renewable and sustainable rainforest products and resources and demanding sustainable harvesting of these resources utilising local communities and indigenous tribes of the rainforests, we all can be part of the solution and the rainforests of the world and it's people can be saved.

Conclusions

There is currently a special need for a more practical approach to bioethics in pharmacy education.

In sum, avoid the wish to render pharmaceutical ethics less complex, to deal with the personal than the principle, or to ignore the person in the form of our patient. We must not fail to impress the importance of understanding their own values, morals and beliefs. We need to continue to explore what comprises respect for the other. “Whose needs am I protecting?.” We need to start exploring in pharmacy undergraduate studies the global consequences and outcomes of drugs’ life cycle, from its design to the dispense.

Nowadays we are at risk for placing:

- To much emphasis on theory without relevance to cases, values or current concerns;
- Inadequate attention to everyday ethics;
- Inadequate attention to conflict resolution process.

I strongly believe that behavior will not change in the short term, but information and respect for the decision-making process will provide an orderly, coherent and reassuring pharmacy practice. Patients and families deserve a clinical judgement, opinion and counseling: this is way to

different from a value judgment, which includes values and personal choice from the perspective of the practitioner.

Health care is also an intimate affair. The logic of bioethics built framework aims to help us to structure our perceptions, to focus on our patient, and to respect *our* part of the dilemma, separately!

Inspired by Hepler's quote, we can state " the question is not whether moral philosophy is important in professional life, but rather how clearly professionals recognize fundamental values and how they can connect their actions to those values".

Rodrigo I. Vargas Gaete: Ethical perspective of forest values

1. Introduction

It seems that ethics has not been internalized enough in the process of decision-making that has led the actions in the woodlands and other elements of forests ecosystems.

Before asserting more seriously the later observation, it must be said that the ethics have evolved in a society dependant on knowledge and discoveries, and consequently on the changes in the perception of the values or what can be considered as socially and morally correct, what is finally the essential concern of the ethics discussion.

An example of this fluctuating situation is the evolution of the relationship between the human being and his or her society, and the woodlands. While following an historic analysis, it is noticeable that the interrelation process between humans and forests has involved various realities in which valuation forms might have changed quite a lot.

2. Evolution of the relationship human being-forest

First, hunter-gatherer societies appeared and developed a harmonious relationship with the forests: more often, humans just used the indispensable resources for their survival. Then occurred the agriculture development and the forests became a useless ecosystem that had to be eliminated to allow access and use of the land for agricultural purposes. This was seen as the solution to population growth.

With the development of the industrial society, the forest began to be considered as a source of goods providing direct benefit. This situation impacted on the woodlands in all the countries and motivated degrading methods of extracting wood that endangered their sustainability.

These different stages of evolution are part of the history of each country, but happen nowadays in various parts of the planet at the same moment. If we consider the current knowledge and valuation of the forests, many will agree that the situation can be ethically criticized. Indeed, now the effect not only the current population but also the development of future generations are taken in account in the decision-making process.

Since the late 18th century In Chile, the rare natural woodlands existing in the north of the country have been transformed into energetic resources so as to develop a mining industry. On the other hand, the largest areas of natural woodland in the south have been destroyed as a consequence of the colonization process dividing lands for agricultural purposes. Moreover, in the late XIX, the progression of the railway towards the south allowed access to the woodlands, leading in turn to the exploitation of the forests and to the transformation of their products into consumer goods.

The degradation of the woodlands that occurred during this stage is not restricted to their destruction but is also due to the application of an incorrect method of exploitation called “floreo”. This consists in taking only the best trees. This results in a great challenge to regenerate and recreate native woodlands degraded during their history, and try to develop a long-term sustainable management plan.

Considering the current estate of post-industrial societies, trends of how to best conserve the woodlands are appearing, generating more and more precise definitions of the environment and society. It leads to a better preoccupation of ecological problems without forgetting the discoveries and the advances in the valuation of the functions and uses of the woodlands.

Here it is important to establish a difference between the concepts of "function" and "use". While the functions can be defined as the intrinsic values of the woodlands, the use is clearly linked to the notion of economic value and to the possibility of acquiring a certain benefit from a function of the forest (Gregersen *et al*, 1997).

Given this, the values associated with a woodland by a person or a group of persons can differ quite a lot depending on the uses considered, as well as the ethical perception, related to its management and/or utilisation.

3. About the functions of a woodland

The properties or conditions inherent to the woodlands have been identified for a long time, as a result to the evolution of the our knowledge.

The functions that acquire a direct use value, such as wood extraction, fruit production, or tourism, will generally be evaluated by a market price. Other functions intrinsic to the woodland can provide indirect use, mostly environmental goods and services. It should be said that all kinds of woodlands provide those different functions, but they are more obviously present and developed in the natural woodlands (Vargas, 1999).

First though we will define more accurately the functions that provide an indirect use and the environmental goods or services furnished. The last point will refer to a function of direct use.

3.1. Regulating functions

3.1.1. Regulation of the water cycle

The trees and the woodlands as a system influence the hydrous cycle through the internal process of the hydrological flow such as evapotranspiration, interception of rain drops and storage of the water in the phreatic levels, which prevents run-off processes and facilitates the availability during the annual cycle and its purification (Sanhueza, 1996).

3.1.2. Regulation of the micro and macroclimate

The permanence of a wooded cover contributes to reduce the difference between the solar energy received and reflected, thus, the forests are considered as thermo regulators. Deforestation tends to generate a local cooling, which is partially compensated by the greenhouse effect (Sanhueza, 1996).

On the other hand fossil fuel use, deforestation and the burning of biomass have determined a greater proportion of gas concentrations (mainly CO2) in the atmosphere. These gases form a permanent cover affecting the radiation processes and generating an artificial heating called the greenhouse effect (CONAF, 1998). The forests in their normal life process, through photosynthesis, release oxygen and absorb carbondioxide, and are thus considered as important agents for the reduction of this gas and the regulation of the global climate.

3.1.3. Sustenance of biodiversity

Forests maintain a habitat that allows the development of vegetal species and animals. They protect biological diversity, and maintain the fundamental relations of sustainability for the permanence of ecosystems. In the meantime, these can display an unsuspected value when considering the genetic potential, the variability of species and its capacity of development

3.1.4. Soils protection and conservation

The ground is exposed to the elements of rain, wind, thermic alterations and human actions in general. The forest is considered as an efficient protection, especially in conditions of greater fragility, slope and exhibition, where the trees maintain a cover of the soil (Vargas, 1999).

3.2. Functions of support

3.2.1. Habitat of indigenous communities

Historically, the forest has lodged numerous indigenous populations in the world, giving place for its sustenance and cultural development (Vargas, 1999). By this way, the forest acquires an identity value for the people who have developed links with the resource; thus, the fact that the model of development of the countries has limited the spaces of coexistence between the indigenous communities and the forest can lead to preoccupations.

3.2.2. Scenic or landscape beauty

Culturally the forest is considered as a natural source of beauty, which at the present time receives greater sense as appeared a great demand of areas for the recreation and enrichment of the human life.

3.3. Informative functions

This kind of function refers mainly to the intangible values of the forest that display relations with spiritual and symbolic feelings, as cultural and historical values determine an intrinsic value of the forests, which has generated in many cases protection and conservation.

Another informative function fulfils the educational and investigating value. Forests are invaluable in relation to the scientific interest, considering the possible discoveries that can be generated by future investigations.

3.4. Productive function

In general, the concept of value of a forest has been associated with direct production, as provision of raw materials, foods, medical resources, etc. When considering this aspect, forests acquires an instrumental value, presenting a utility that resides in the satisfaction of certain necessities and allowing an economic advantage (Simula, 1997).

The utilisation of this function has been the general tendency of valuation of the forests in Chile and has marked the directions of management implanted with the purpose of maximising the utilities.

4. About forest development in Chile

The Chilean forest sector is one of the most important within the local economy, contributing 2500 million dollars in exports annually. This reality was generated when, in 1974, the military government proposed a specific law that discounted the plantations in forest aptitude lands (Decree law 701). The growth based on exotic plantations integrated the Chilean forest sector to the worldwide market, providing raw materials to the wood and paper industries of Asia, Europe and North America.

The sector has seen enormous growth ever since; in the mid Seventies nearly 300 thousand hectares of plantations existed, a number that has grown considerably and that at the present time presents a surface of 2.4 million hectares. The fast growth generated in the last thirty years has been 95% sustained by plantations of monocultures constituted of *pine* and *eucalyptus* trees (CORMA, 2003).

4.1. Conflicts in the forest sector

Various problems were generated in the shade of the fast growth of the forest plantations. The substitution of the native forest, replaced by monocultures of fast growth, the acquisition of indigenous lands by foresters and the systems of harvest especially clear cut, are factors that generate economic growth but make it totally questionable from an ethical point of view, when considering the value that the native forest ecosystems represent both at local and global levels.

The replaced surface of native forest between 1985 and 1994, according to a study of the Forest National Corporation (Emanuelli, 1997), surpassed the 140 thousand hectares. If the losses due to illegal cuts and other uses of land (mainly agriculture) are added to this surface, the average of annual substitution area is superior to 18,5 thousands ha. Considering the same period of pursuit, the area of operated native forests without attachment to legal norms of management, reached a total near to 145 thousands ha. Number that the surface of natural forests exploited according to the norms surpasses in 15 %. It is then possible to appreciate how the native forests aside from presenting a considerable annual reduction by substitution, also displays an important loss of value product of a bad management.

To the problem of the native forest is added the conflict with the Mapuches indigenous communities, which is a product of the lack of clarity in the acquisition of lands by the foresters and the land appropriation that took place after the denominated agrarian contra-reform in the mid-Seventies. The problems between the two parties have still not been resolved, and during protests the indigenous people are often affected, and the capital of the foresters is damaged.

On the other hand, when reasoning on the regulating and support functions that are also partly provided by the exotic plantations of fast growth, one has to consider that they are totally interrupted when a clear cut happens, which is the method most used to exploit monocultures.

4.2. Towards some solutions

The environmental problems that have been generated by the growth of the population have been partly to blame for the increase in the collective preoccupation at local and global level concerning these subjects. To such extend that in many cases a demand for products that are certified as not contributing to unsustainable environmental and social practices has been generated.

When observing the Chilean forest model, it is clear that there is a clear predominance of economic factors compared to the environmental and the social ones; the fact that nowadays international standards exist that transform these externalities into costs for the companies, can be considered as a beginning of a solution to the problems of substitution of native forest and the Mapuche conflict. Initiatives like FSC (Forest Stewardship Council) that certify the good handling of the forests from the social, environmental and economical points of view, are considered very beneficial for the real sustainability of the forest sector in the country.

Another important point is the integration of the natural forest within the forest production sector. Initiatives such as the project of law on recovery of the native forests and forests promotion are considered as essential in the will to generate a diversified forest sector that considers the other functions of the forests.

5. Discussion

Knowing the main changes that have taken place in the relationship between humans and forests throughout history can help us to understand that

necessities and knowledge have determined the value attributed to this resource by the people.

Obviously it is very easy to question the battles conducted in the past, when the value of the forest was not fixed by present parameters and the concept of sustainable development did not exist.

A small analysis of the functions provided by the forests and the possible uses that can be obtained from each one of them shows that it is practically impossible to forget the environmental, social and productive outcomes without integrating an ethical point of view into forest management.

The challenge for the Chilean forest sector is now to generate a change in the current valuation of the forest involving the regulating, support and informative functions, with the purpose of obtaining a concept of sustainable development of large spectra. It is desirable that this process is generated by a greater conscience in the legislation and an improvement in the control of the fulfillment of the present and future norms.

This must be accompanied by a critical education of forest sciences, where the ethical concepts related to the valuation and to the management are emphasised. At the present time, none of the 11 universities of Forest Engineering in Chile includes forest ethics in the curriculum. Obviously this subject can be treated within another subject or theme, but it should be considered as an important inclusion at a time of searching justifications to the merely economic forest model that reigns in the country.

To open the discussion it is also ethically questionable to prioritise (so-called) conservationist measures when the aim of the government is to generate poles of development and opportunities for people.

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Mariana Hepp, Bernardo Martorell, Gonzalo Navarrete: Health from an environmental point of view

Introduction

With the passage of time, humankind has come to constitute the greatest evolutionary force of nature, overcoming almost all obstacles in its way. Knowledge about the world and scientific advances has taken us further than we could have ever imagined. Far from bringing us satisfaction and happiness however, these triumphs seem to have leaded us further away from the life of which we dreamt. For example, if we look at world health statistics, we can see that depression is the third leading cause of the loss of healthy years, and even worse, everything indicates that it will have become the number one cause by 2020. Is it possible that progress has not served humankind? Have we lost our way? It seems that this progress, rather than bringing us peace and joy, has made us more and more unhappy, aggressive and distrustful of others. The way of life that we have developed does not fulfil our expectations of life that we human beings have.

When we question ourselves about human nature, we realise that there we cannot consider human beings without taking into consideration their environmental context. What we do affects others. And not just those in the present but future generations as well. When our actions affect our surroundings, we are acting on something that belongs to us all and of which we are all part, and therefore we must take responsibility for our actions. When we speak of surroundings we not only refer to our physical environment but also and principally to a "relational" one. Our surroundings are made of other beings: human, animal, vegetable, etc. We are part of a system in which everything is related, and what we do affects each and single part of that system. That is why, when we speak about our environment, we include a broad variety of issues from genetic intervention in food up to the human relationships we construct. These two kinds of actions, apparently different, are real interventions in our surroundings. And not only in ours, but in the surroundings of all future generations to come.

Health, environment and human interaction

It is very difficult to define health and sickness. There have been many theories proposed. Hippocrates defined health as the harmonic balance of elements and qualities of life, and sickness as the loss of that harmony. He considered that the forces that intervene in that harmony have natural origins. That vision seems as true today as it was in his day, and it is the view we want to defend. One essential condition of living creatures is their capacity to adapt to changes that occurs in their environment, so as to maintain their "homeostasis"(inner balance). Human beings respond to the environment many different ways. For example, many aspects of sickness, that is "feeling sick", are really a response of the organism to environmental aggressions. The immune system is continuously reacting and modifying itself to cope with its surroundings. This is only one of an infinite number of examples.

The foundation of our argument is the fact that humans are simply one of many species on this planet and therefore our health and manner of living must be compatible with the evolution and biology of our planet and all other species. In this sense we must consider many facts of human

biology have not yet been considered. For example, we think that the improvements in knowledge about evolutionary theories of reason, feelings, social interactions and ethnic differences are important elements in understanding and therefore defining human conduct and guiding actual decision-making and lifestyles.

Bioethics is a discipline, which responds to a fundamental and biological necessity in the realm of human relations. This is because it aims to regulate social interaction in a way that increases the beneficial impact of social relations. This is true considering that our evolution has conserved ways of living that involve aspects like solidarity and respect to others as valid individuals. Without these emotions or attitudes, human survival would not have been possible. Human beings had to cluster together to survive and protect one another from a sometimes hostile environment. Those who better developed their social abilities were probably able to achieve their reproductive and survival objectives in a much more efficient manner than those who persisted individually or without grouping together. In this context, skills like solidarity, cooperation, defending and taking care of each other were always highly adaptive. In other words, these characteristics were absolutely necessary for survival and those who possessed them carried them through to the next generation, right up to present day. On the other hand, non-adaptive attitudes led to greater susceptibility to environmental dangers and therefore easy prey for the innumerable hunters of the past, and vulnerability to the physical elements.

Role of medicine and bioethics

Today, bioethics has many roles to play. When we intervene in an environment that belongs to everyone, we should do it with the responsibility of what this implies. For example, it is necessary to study the impact of every intervention that can possibly damage the ecosystem that is not only the heritage of all humanity, but of all species on earth. Something like this has occurred in the case of genetic intervention in food and here bioethics has played an essential and regulating role. In this case, bioethics is a social demand to take and cherish that belongs to us all.

We do not wish to speak about technological interventions on the edge of scientific investigation however, we want to speak about the ethics of every day actions, of the ecological relationship between humans and our planet. More precisely, the ethic that we want to promote is not one that appears only when we want to create conflict, but one which accompanies us daily, laying the foundation for a harmonious and more generous lifestyle between among all beings, and between them and their environment, all this based on the biological knowledge of our nature.

Medicine has "compartmentalised" human beings leaving them isolated, not only as individuals and with other species, but also each part of every person. It is not possible to understand nature by studying humans in isolation without considering their surroundings. We have to refocus our understanding of humankind to include our surroundings and relationships, so as to be able to better understand ourselves. What part does bioethics play in all this? As medical students we realise that we are distancing ourselves on a daily basis from the “ideal” model of attention that we dreamt of in the dawn of civilisation. Imagine those great Greek philosophers dreaming of the future, thinking that our present-day societies, after thousands of years of learning, would be made up by beings that help one another to live in harmony, a society where everyone plays their part, where the sick are cared for with love, and healthcare is freely available to all. Instead, today doctors and patient sit face to face, as two negotiators, where values like compassion, solidarity and understanding are totally absent. Ethics today are offered from the most depths of society as an answer, as a road to be followed, as visions for the future, to reach agreements, to construct a fairer society. Ethics is more than a system for making correct decisions, it is a system that flows from the very ideal society to reach

itself, as a proposal of a way of life. As medical students, we see a need to change the path we are on, and we see bioethics as the tool for this.

Bioethics has the potential to play a fundamental role in the preventing sickness, promoting healthy lifestyles and harmonious relations, while taking into account the fact that attitudes like solidarity and collaboration are part of our biological inheritance. We propose therefore that bioethics be used as a fundamental tool in the prevention of disease and therefore as a weapon in health promotion. In this way, we believe that the physician should act as a defender of health and an agent who promotes bioethically acceptable relationships. Physicians must also carry out inter-sectorial community action at different levels, transforming bioethics from its applicability in limited situations, into an action that intervenes at the prevention level. This would in turn necessitate the inclusion of bioethics in the curriculum of medical students, thereby ensuring socially responsible physicians capable of promoting bioethics as a fundamental tool in the promotion of health. This would also respond to the biological necessity of humans to prevent disease.

Final words

Medicine has always worried about the understanding humankind. Today's scientific advances have permitted a more complete understanding of human beings and their nature. Thanks to modern knowledge, we can take a more comprehensive approach to human healing, especially given our biological inheritance of collaboration between one another, and that this cannot be in against our very culture. Is this what is happening today? Is our lifestyle contradicting our biological need for solidarity and understanding? Bioethics provides us with an answer, gives us the way forward to a better future, and is therefore needed in medical practice as a daily tool. As medical students, it is our mission to achieve this because we believe in this truth. This will finally oblige humans to act according to a line of action that promotes the health and the well-being of every one of us.

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Jens Erik Fenstad: Address to the ministerial meeting

Chair of COMEST

Excellencies,
Ladies and Gentlemen,

Thank you for the invitation to address the Ministerial Regional Meeting. I hope that my remarks may contribute to the important task of a Ministerial Declaration on Ethics of Science and Technology.

Background

In 1999 UNESCO, with the cooperation of ICSU, the International Council of Science, held a World Conference on Science - "Science for the Twenty-First Century - a new commitment."

The conference, which was attended by more than 150 nations, adopted a "Declaration on Science and the Use of Scientific Knowledge". This declaration was later adopted by UNESCO and member nations and has served as an important guide for further action.

The Declaration notes the many remarkable advances in science and its applications and calls on the nations and scientists of the world to use this knowledge from all fields of science in a responsible manner to address human needs.

But the Declaration also notes that there are dangers involved. Science and technology have sometimes led to environmental degradation and technological disasters and have contributed to social imbalance and exclusion.

Thus it is not only the efficient use of science that is called for. It is the responsible use we need. This in our context means a new emphasis on the ethics of science and technology. And its gives a special urgency to the work of COMEST - the UNESCO World Commission on the Ethics of Scientific Knowledge and Technology.

New developments in science and technology - ethical challenges

Let me now mention some new trends in science and technology and some of the ethical challenges involved. Many of these issues have been discussed in other sessions of this meeting; I shall therefore be brief. In developing these remarks I have made use of the ICSU background paper "Ethics and the Responsibility of Science" to the World Conference on Science in 1999.

We are today confronted with a large number of ethical challenges and value conflicts related to new technologies, changing social and human conditions, and the exploitation of the environment. With scientific progress, new and unfamiliar situations continually emerge, creating circumstances in which our traditional concepts (of, for example, truth, reality, space-time, mind, human nature and morality) are called into question. Classical notions may no longer seem applicable to reality by the new descriptions offered, and our habitual, accustomed attitudes or ways of life may come to appear threatened. Rapid scientific advance seems to outstrip our moral sensibility and judgement. There is often a dramatic tension between 'good' and 'bad' uses of new scientific concepts, theories and methods; as well as the notoriously tricky problem of deciding who is to determine what is good or bad: scientists? politicians? the general public?

The challenges are manifold: to construct a coherent ethical position that covers a wide

variety of related issues; to balance emotional reactions against rational arguments; and, not least, properly to understand the scientific facts that underlie the situation.

Let me turn to some specific examples:

Biotechnology

Biotechnological advances (e.g. recombinant DNA-techniques) have provided humans with tools giving rise to many difficult ethical problems. As the genome of various species (including the human) is gradually decoded, we gain possibilities to interfere with and design other living organisms. Consider, for example, the fact that we learn more and more about genetic dispositions that may or may not develop. Should we and/or others have unlimited access to this information? Given that we have the information, to what extent should it lead to action? Who is responsible for making these decisions? Concepts such as human dignity, and integrity are essential parts of this debate. The UNESCO Declaration on the Human Genome is an important measure to adopt a unified policy towards these important ethical issues. Similar problems emerge with non-human uses of biotechnology. The release of genetically modified organisms into nature, for instance, may have a profound impact on the existing gene pool. What risks should we regard as ethically acceptable?

Nanotechnology

Nanotechnology is a new manufacturing technology with the aim of making new particles at the nanoscale level (one nanometer being one billionth of a meter) in order to create new functional materials, new components and systems to perform, in particular, "intelligent" function at the scale 0,1 to 100 nanometers. Nanotechnology is today at a very preliminary stage, but further developed could have enormous impact, if combined with current advances in biotechnology. One scenario, still at the science fiction level, calls for the integration of man and machines by inserting machines or "robots" at the nanoscale level into human beings to interact with or control the individual in the performance of a number of "human" activities. Obviously, such a new technology raises a number of ethical issues. The technology is not yet there, but we need to be prepared in order not to repeat past mistakes.

Information and communication technology

The revolution in information technology (ICT) has risks as grand as its potentials. The development of Internet and the Web has not only brought fruitful advances in ICT, but also created dependence on these results. As our deep concern for the switch to a new millennium reveals, many countries are extremely vulnerable to cyberspace breakdowns in their information-dependent systems, such as infrastructure (air traffic, electric power, etc.). Such breakdowns could happen due to accidents, or intentional interference (by hackers, for example); or they could become objects in a cyberspace war. Difficult problems of scientific ethics and international security ensue from this new situation. But in addition to these risks we are also faced with a crucial problem of access to the new technology. A "digital divide" has emerged and seems to ever grow wider. To reverse this trend is not only a political and technological issue, it is also an ethical challenge.

The brain and cognitive sciences

Developments in the brain sciences, psychiatry and the philosophy of mind, call into question many traditional views; notably, of the self. Scientific beliefs about the nature of the self have strong ethical relevance. Related to this is the issue of reducibility, or, in another terminology, the mind/brain relationship. To which extent are

cognitive functions of an individual reducible to brain processes of the same individual? Mind presupposes brain, but is mind reducible to brain? And if mind is reducible to brain and biology, what does this means for human acts and responsibility? This is not only a scientific question but also a question with deep moral significance.

Environment/sustainability

The World Summit on Sustainable Development, which took place in Johannesburg in 2002, once more highlighted the urgency of environmental issues. The challenges are many and well known: the fossil fuels used in industrial developments are increasing the carbon dioxide content in the atmosphere, threatening to create a greenhouse effect; urbanization is eating into agricultural land and woodlands; industrial expansion is increasing pollution and loss of fresh water resources; exploitations of many kinds are threatening the needed biodiversity of the planet. COMEST is now making a major effort in developing an ethics for environment and sustainability. A project on the precautionary principle and its relevance for the developing countries is a first step in this direction.

Ethics and responsibility

In response to the problems raised by the new trends in science and technology we have seen a shift from *freedom* and *trust* to issues of *responsibility* and *accountability*. This in turn means, as already noted, a new emphasis on the ethics of science and technology. The world faces great challenges, most of them indirectly or directly related to science. Technological disasters, environmental degradation and growing social and economic imbalance between rich and poor have led to an increasing mistrust in science, often directed against the development and applications of new technology, notably biotechnology.

The development towards higher degree of contract research and business led research, has taken this skepticism even further. The growing understanding that science is not free from the scientist disciplinary background, interests, values, viewpoints and relations to other actors in society, underlines the need for a stronger emphasis on ethics as well.

Scientists face ethical problems in their choice of education and research field, in their choice of research projects, in how they carry out their research, and in how they deal with publication and media. How can we make sure that the scientist maintains high standards of scientific integrity and quality control when the relationship between the researcher and other actors as universities, the state, corporations and international trade organizations are changing? How can one increase the young scientists' ability to distinguish right from wrong and to feel social and environmental responsibility?

Today most people agree that one must establish good strategies for securing sustainable development. The teaching of ethics can play a decisive role in the work for sustainability. Ethical values are the principal factor in social cohesion and, at the same time, the most effective agent of change and transformation. In considering the

ethics of sustainability, our moral responsibility towards future generations is of primordial importance. In living up to this responsibility, we must strive to achieve balance and continuity between meeting the needs of today and the challenges of the future.

Scientific uncertainty and the public dialogue

At its 29th session in 1998 the General Conference of UNESCO decided to create a World Commission on the Ethics of Scientific Knowledge and Technology (COMEST). The mandate of COMEST is broad. The Commission should:

- serve as an intellectual forum for the exchange of ideas and experiences;
- detect on that basis early signs of risk situations;
- fulfill an advisory role for decision-makers in this respect;
- promote dialogue between scientific communities, decision-makers and the
- public at large.

The last point is of outmost importance. The ICSU background report to the World Conference on Science discusses this issue in some details. Scientific knowledge is typically organised in theories covering a wide variety of phenomena. In order to arrive at insights about generalised basic phenomena scientists employ processes of idealisation and abstraction, both in its conceptual basis and in the data. The typical complexity of singular phenomena necessitates simplifications. In many areas, e.g. environmental science, we deal with highly complex systems. This means that science often faces *high system uncertainties* coupled with *high decision stakes* (e.g. ecological factors). This provides for new challenges with regard to ethical issues. There are two main problems. The first relates to the methodological choices. Alternative approaches often yield different outcomes, and may reflect implicit conflicting values. The scientific adequacy should not be compromised by these implicit values. The second problem relates to the presentation. For a decision-maker the uncertainties are at least as valuable as the specific insights that are gained. It is therefore of vital importance that relevant uncertainties are communicated in a way which reflect their importance in the decision-making process. But scientists typically have little training in making visible those things they do not know, or that might turn out otherwise than predicted. To the extent that science fails to communicate relevant uncertainties it fails to provide trustworthy information.

The teaching of ethics

In the *Framework for Action* adopted at the World Conference on Science in 1999 there is a special section on ethical issues. In paragraph 71 of that section we read:

> *Ethics and responsibility of science should be an integral part of the education and training of all scientists. It is important to instil in students a positive attitude towards reflection, alertness and awareness of the ethical dilemmas they may encounter in their professional life. Young scientists should be appropriately encouraged to respect and adhere to the basic ethical principles and responsibilities of science. UNESCO's World Commission on the Ethics of Scientific Knowledge and Technology (COMEST), in cooperation with ICSU's Standing Committee on Responsibility and Ethics of Science (SCRES), have a special responsibility to follow up on this issue.*

The challenge has been taken up. COMEST responded by establishing a working group to give the necessary advice on how to integrate an awareness of and competence in ethics and the responsibility of science in the training of every young scientists. This work was done in cooperation with ICSU. The Working Group has

recently submitted its Report "The Teaching of Ethics", which was discussed earlier at this meeting; we shall draw attention to a few points of principle from the Report:

The central aim of the teaching of ethics should be to develop the students' ability to recognize and analyse ethical issues in order to be able to reach decisions on how to act ethically. This comprises several partial aims:

- The study should increase the students' awareness of ethical issues
- Provide a deeper understanding of ethical matters and greater clarity in ethical questions
- Place ethical problems in a wider context and make explicit the alternatives that we may choose from, and how their various positive and negative consequences are experienced by those who are affected
- Develop the skill for ethical analysis and argumentation
- Determine areas where social practice or legislation is at odds with ethical standpoints which seem to be well-founded

As for the first of these points, it is important that the ethics courses are open to cultural and traditional differences. There are great regional differences concerning what are viewed as the most actual ethical problems. The challenges are also quite different in poor and rich countries. Religious differences as well will affect the way ethical dilemmas are viewed and reflected on in different places. It is, however, also important to locate issues that ought to be reflected on and discussed, but which are so deeply ingrained in a culture that they tend to go unnoticed.

For students working in other cultures than their own, for example in connection with fieldwork, it is crucial to be aware of regional differences. In the students' later professional work it is important to keep these differences in mind. Different countries and different regions often face different ethical problems. Regional differences in the urgency of different ethical problems and in ways of dealing with them should be taken into account in courses held in different parts of the world.

For the developing countries it is particularly important to build up competence in ethics. These countries are exploited in so many ways, through unfair trade agreements, bad treatment of workers, takeover of natural resources, land, water, etc., patenting of biological material or of insights based on traditional knowledge, introduction of plants or cultivation methods that destroy traditional life styles and cultures, and also tests on new drugs under conditions that are illegal in most developed countries. The examples can be multiplied, but they show that the developing countries stand the most to gain by building up ethical competence, preferably combined with competence in other fields

A concluding remark

In conclusion let me express the hope that these remarks may be of some use for this ministerial meeting and for the preparation of the Rio Ministerial Declaration on the Ethics of Science and Technology. I wish you success in this important task.

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ADDENDUM: RIO DE JANEIRO DECLARATION ON ETHICS IN SCIENCE AND TECHNOLOGY

The following declaration is an outcome of the Ministerial Meeting of Ministers and Higher Authorities of Science and Technology of South America. It was endorsed by the Ministries of the CPLP, and transmitted to UNESCO.

Rio de Janeiro Declaration on Ethics in Science and Technology

We, the Ministers and Higher Authorities of Science and Technology of South America, gathered in Rio de Janeiro on this 4th day of December, 2003, to reflect upon the limits that ethics impose on the production and use of scientific knowledge,

Considering:

the Declaration on the Use of Scientific Knowledge, signed in Budapest in 1999, that placed science in its social and international context as an instrument for the well being of all peoples, and called upon all countries to work for the good of humanity;

the overwhelming process of economic globalization and the growing impact of scientific development and technological innovations on our societies;

that the South American countries represented at this meeting recognize the need in the elaboration of their management policies for scientific and technological development to pay special attention to the ethical implications, so that principles founded upon such policies may serve as guidance for efforts to achieve the well-being of their peoples and their autonomy as nations;

that a more democratic and far-reaching application of this knowledge requires national and regional development projects that include society as a whole;

that such projects must be viewed from the harmonic perspective of our peoples' common international interests, in order to confront the current trends of globalization in the realm of science, technology, economics, politics, and culture;

that the ethical and human conscience that grows at the heart of our societies impels us to prioritize, in the distribution of the benefits of knowledge to all, especially to women and children as well as all facets of excluded and marginalized segments of society, and the production of knowledge by women;

that the principles of democracy and social justice should govern international relations, serving as a reference for fraternity among countries, nations, and peoples;

that democracy, independence, and respect not only for individual and regional differences but also for the right and the struggle for peace, must reflect, within our countries, the same struggle for liberty, respect for human rights and, fundamentally, access for all to the intangible and practical benefits of human knowledge in culture, the arts, science and technology, through education and democratization of the results of economic development;

that we must defend an international system that elects to combat hunger and exclusion, especially exclusion from all forms of knowledge, as the highest priority, promoting universal quality education and that assures the right of all to healthcare, education, and housing while at the same time hinders abuses of power, condemns discrimination, and denounces intolerance and all other conditions or interests that may lead to war and the breakdown of democratic structures;

that free access to scientific knowledge and to effective participation in its creation, as well as the technological development and innovation, allowing the integration of our efforts, especially with respect to the establishment of an effective network of scientific and technological cooperation;

recognizing that the scientific and technological component forms the basis of the so-called "knowledge economy" - the economy of the third millennium - and that improved scientific and technological capacity will allow the participation in this economy and therefore in development; and

Facing limits imposed by international trade rules which, most of the time, do not consider the interests of the

developing countries and their populations, and that our countries will also face competition from those countries possessing technology, as well as their transnational companies, the main beneficiaries of so-called "globalization".

Do recommend:

that the foundational activities for science and technology, such as education, scientific research, culture and technological development, be recognized and treated as public goods, and that an effort be made to diffuse knowledge, placing it at the disposal of humanity, especially the communities of the Third World;

that the governments of the Region support UNESCO in its efforts to allow the sectors and activities which constitute the "knowledge economy" (education, science, and culture) to contribute to socio-economic development in order to ensure the effective democratization of the components of knowledge generated by the digital industry and to render more flexible trade practices in the international regime of intellectual property, particularly in public health;

that the governments devote greater attention to the treatment given to science and technology in the context of the international trade rules and negotiations, adopting new critical approaches to the rules in effect and generating innovative proposals that increase access for the countries in the Region to knowledge and its benefits;

that our governments promote and stimulate the dissemination of information and knowledge through significant investments in R&D, information technology, robotics and computer science, software and hardware, popularizing the sources and the means of information as well as promoting universal access for all citizens;

that our governments support the increase in the use and production of software, seeking autonomy and cost reductions for the countries of the region;

that national and regional research groups be established with the objective of studying alternatives for the production of low-cost personal computers, aimed at universalizing usage of such computers, as well as implementing projects for regional cooperation in this field;

Do further recommend:

That attention be given to non-proprietary treatment of software, transmissions, and other digital technologies essential to ensuring the linguistic-cultural diversity of countries with relatively low representation on the Internet as well as in the use of electronic databases;

That an international network of scientific and technological knowledge be created, public in nature and freely accessible, also linked to databases on patents and inventions;

That a fund be established for the promotion of education, science, and culture in cyberspace, in support of networks of public schools, universities and research institutes in the countries of the Region, whose objective would be to promote science in the classroom and its popularization;

that the protection of individual rights and freedoms be promoted in measures relating to the fight against terrorism and to the promotion of a culture of cybersecurity;

that nations work together for the creation of an international consensus for the conversion of a portion of the payment of the external debt of developing countries into national investments in science and technology;

that our governments consider, the development of capacities which allow people to have access to new knowledge that make possible their productive participation in new sectors, if technological change so demands;

that the commitment to create spaces of cooperation in science and technology among our countries be reiterated, in both the public and private sectors, taking into account the ethical, political, social, and economic challenges they face;

that the essential role of the United Nations System's specialized agencies, particularly UNESCO, be recognized in supporting the elaboration of effective policies and

guidelines in the field of ethics of Science and Technology and in technical cooperation through the exchange of international specialists, resource mobilization programs for the promotion of integrated interdisciplinary approaches to cooperation for development in science and technology and for the transfer of technological knowledge;

that UNESCO's work in the field of Ethics of Science and Technology and its role as focal point and legitimate participant in the worldwide debate over this issue be recognized and supported;

that the establishment, by UNESCO, of a mechanism that integrates and proposes dialogue on issues related to the Ethics of Science and Technology among our Governments be supported in order to promote the creation of programs for the teaching of ethics in basic, secondary and higher education and teacher training programs in this area; and the establishment of a network of governmental and non-governmental institutions in this area be supported;

that the work of COMEST as an independent advisory body of UNESCO regarding issues of Ethics in Science and Technology be recognized and that participation in this Commission be improved by the continued inclusion of representatives from all continents;

that the recommendations set forth by COMEST in such areas as the teaching of ethics, outer space, energy, and water be examined, in order to reinforce and to incorporate where necessary this ethical reflection in national and regional policies, in strategies, and in projects;

that States, organizations and other institutions interested in promoting and deepening reflection on the ethics of science be encouraged to create national and institutional commissions on scientific ethics;

that States be urged to implement, within the shortest time possible, the Universal Declaration on the Human Genome and Human Rights, approved in 1997 at the United Nations General Assembly;

and that the International Declaration on Human Genetic Data, approved at the 32nd UNESCO General Conference, be supported.

Thus, the Ministers and Higher Authorities of Science and Technology of South America, gathered in Rio de Janeiro, request the Heads of State and Government to confirm the growing importance of the ethical dimension of Science and Technology for the promotion of sustainable and equitable development, supporting the strengthening of cooperation in Science and Technology, above all with respect to their ethical implications, among the countries of South America, under the terms of the present Declaration.

The signatories hereby agree to transmit this Declaration to the Secretary General of the United Nations, as well as to the Director-General of UNESCO.

Rio de Janeiro, December 4, 2003

Signatories:

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Tulio Del Bono
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Division of Ethics of Science and Technology of UNESCO

The Division of Ethics of Science and Technology reflects the priority UNESCO gives to ethics of science and technology, with emphasis on bioethics. One objective of the medium-term strategy of the Organization is to "promote principles and ethical norms to guide scientific and technological development and social transformation".

Activities of the Division include providing support for Member States of UNESCO that are planning to develop activities in the field of ethics of science and technology, such as teaching programmes, national ethics committees, conferences and UNESCO Chairs.

The Division also ensures the executive secretariat for three international ethics bodies, namely the World Commission on the Ethics of Scientific Knowledge and Technology (COMEST), the International Bioethics Committee (IBC) and the Intergovernmental Bioethics Committee (IGBC).

For any further information, please contact:

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