

Tokyo Symposium

Science and Culture:

**A COMMON
PATH
FOR THE
FUTURE**

Final Report

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WELCOMING REMARKS

by Heitor Gurgulino de Souza
Rector, United Nations University

Director General Federico Mayor, Nobel Prize Winner Kenzaburo Oe, Commander Jacques-Yves Cousteau, Director-General Ohtsuka, Director-General Sate,
Your Excellencies,
Distinguished Guests,
Ladies and Gentlemen,

It is my distinct honour to welcome you to this joint UNESCO-UNU Symposium on Science and Culture in the anniversary years of the founding of our two organizations.

Over twenty years ago at UNESCO headquarters in Paris, the founding committee for the United Nations University (UNU) met to determine such important matters as selecting Japan as the gracious host country for this new international University.

At those meetings under the crucial guidance of the then UNESCO Director-General and his capable staff, together with the United Nations Secretary-General's representative, the basic course for the United Nations University was ably charted.

From the beginning it was realized that there must be a close degree of cooperation between our two organizations, as well as the United Nations Institute for Training and Research.

Memorable past successful collaboration between UNU and UNESCO have covered many areas, programmes and activities and more recently have included the establishment of a UNU/UNESCO chair in plant biotechnology at the University of Beijing, China. Furthermore, UNESCO hosted in its Nairobi Office the initial Programme for the UNU's activities in natural resources in Africa, the beginning of our Institute for Natural Resources in Africa (UNU/INRA) now located in Accra, Ghana and Lusaka, Zambia.

The generous support of the Government of Japan through its innovative trust fund to facilitate greater opportunities for joint research and training activities, between UNU and UNESCO like this symposium, has been very much responsible for these welcome cooperative endeavors.

On behalf of the UNU I would like to recall these close bonds between our two organizations and recommit ourselves today to redoubling our efforts to find greater areas for collaboration in the near future, especially in the fields of science and culture.

I am so glad that my dear personal friend Director-General Federico Mayor could be with us today to give the opening address of this Symposium. We remember fondly his participation with other dignitaries at the dedication ceremony for this new UNU headquarters building two and a half years ago.

I would also like to acknowledge the constant support and interest in our work by the distinguished representatives from the Ministries of Foreign Affairs and of Education, Science and Culture, that with the Japan Foundation are supporting this symposium in collaboration with the National Federation of UNESCO Associations in Japan.

We are particularly honoured to have as our keynote speakers two great leaders of the worldwide intellectual community who have done so much to bridge the gap between pure science and the humanities.

The literary work of Kenzaburo Oe has been recently recognized by the Nobel Prize committee as speaking to all peoples of the world across all boundaries of time and space. And the life's work of Jacques Cousteau has rightly made his name a household word to all those who love science, adventure and nature. I could not think of two better minds to stimulate our deliberations over this week.

We are also extremely fortunate in having so many leading scholars take time out of their busy schedules to give us the benefit of their collective wisdom, I wish them well in their endeavors and eagerly await the release of their message to the world from this Tokyo Symposium.

C. P. Snow in his famous book 'The Two Cultures and a Second Look'⁽¹⁾, quotes a story attributed to A. L. Smith mentioning what happened to one of the more convivial Oxford great dons who went to Cambridge for dinner. And I quote: 'The date is perhaps the 1890's, I think it must have been at St John's, or possibly Trinity. Anyway, Smith was sitting at the right hand of the president - or Vice-Master - and he was a man who liked to include all round him in the conversation, although he was not immediately encouraged by the expressions of his neighbors. He addressed some cheerful Oxonian chit-chat at the one opposite to him, and got a grunt. He then tried the man on his own right hand and got another grunt. Then, rather to his surprise, one looked at the other and said, 'Do you know what has talking about? I haven't the least idea'. At this, even Smith was getting out of his depth. But the President, acting as a social emollient, put him at his ease by saying, 'Oh, those are mathematicians! We never talk to them'. In his 'second look' C. P. Snow also adds: 'Persons educated with the greatest intensity we know can no longer communicate with each other on the plane of their major intellectual concern. This serious for our creative, intellectual and, above all, our normal life. It is leading us to interpret the past wrongly, to misjudge the present, and to deny our hopes of the future. It is making it difficult or impossible for us to take good action.

(1) 'The two Cultures and a Seond Look', C.P. Snow, Cambridge University Press, 1981

I gave the most pointed example of this lack of communication in the shape of two groups of people, representing what I have christened 'the two cultures'. One of these contained the scientists, whose weight, achievement and influence did not need stressing. The other contained the literary intellectuals. I did not mean that literary intellectuals act as the main decision-makers of the western world. I meant that literary intellectuals represent, vocalize, and to some extent shape and predict the mood of the non-scientific culture: they do not make the decisions, but their works seep into the minds of those who do. Between these two groups - the scientists and the literary intellectuals - there is little communication and, instead of fellow-feeling, something like hostility' - End quote.

I am sure in this symposium there will be no hostility but a profitable dialogue that will lead science and culture in a common path to a better future.

The underlying theme for our symposium has been elegantly summed up by Director-General Mayor as - And I quote:

'The Key to the future lies in the human spirit, not in technology. In a world which is, happily, moving in the direction of universal democracy, purely technical institutions will soon decay. The only ones to survive will be those capable of pointing out new paths, devising fresh approaches and shaping new patterns of daily behaviour' - End quote.

We at the UNU very much share this view of the challenge to rethink our future in a transdisciplinary and innovative way.

I know the Director-General will also elaborate on this further in his opening address shortly.

Finally, if I may, I would like to reflect briefly about the next twenty years of the UNU. We are now preparing to submit to our governing Council a Medium-Term Perspective, that will guide UNU's activities into the beginning of the next century (1996-2001). But I am sure it will certainly be valid for addressing the pressing global problems of human survival, development and welfare for a couple of decades ahead of that period since these are challenges that are also in the agendas of the United Nations and UNESCO: Peace and governance, development (in its broadest sense), environment and science and technology are some of the keys areas already identified for priority action by our headquarters in Tokyo and by our research and training centers and programmes as well as by our networks of scholars throughout the world. Other areas and dimensions are being explored and this symposium will certainly help us with innovative ideas for research and post-graduate training and for dissemination of knowledge, essential elements of UNU's mandate.

This anniversary year has been a watershed for us with the realization of our new Institute of Advanced Studies (UNU/IAS) here in Tokyo. But the prospects of these new exciting challenges have also brought with them added responsibilities in these times of

shrinking budgets for international academic institutions. As the UNU reaches out to renew its connections with the international and local academic communities through the UNU/IAS, we very much hope that greater avenues for cooperation and support might be found to ensure a brighter future for our work.

In these demanding endeavors we know we can always rely on the cooperation, support and assistance of UNESCO the fundamental support of our host country, Japan, and other countries around the world.

The United Nations University with its unique mandate and structure can tap on the best minds of the world to address global issues linking the academic community with the UN system and performing for the system the functions of a 'think-tank', as stated by the UN Secretary-General Boutros Boutros-Ghali, in 1992.

We have done our best over the past ten years. With your participation and continued support we hope to do better in the next two decades, well into the next century, for the benefit of humankind.

ADDRESS
BY MR FEDERICO MAYOR
DIRECTOR-GENERAL OF UNESCO

Mr Rector of the United Nations University,
Mr Vice-Minister of Education,
Distinguished Nobel Laureate Kenzaburo Ohe,
My good friend Jacques-Yves Cousteau,
Distinguished participants,
Excellencies, Ladies and gentlemen,

I am very pleased to be with you at the opening of this symposium 'Science and Culture: A Common Path for the Future', which UNESCO is organizing in partnership with the UNU and the Japanese National Commission for UNESCO. It is a source of great satisfaction that such a distinguished group of participants should have come together to discuss this crucial topic, and a particular pleasure for me that they should include some longstanding friends.

Let me begin with a word of tribute to our partners in the organization of this meeting. I should like to thank Professor Heitor Gurgulino de Souza for hosting this meeting and, more generally, for all he is doing to make the UNU an effective instrument for the promotion of international research and reflection on issues of global concern. I also wish to acknowledge with gratitude the leading role of Mr Yosono, Minister of Education of Japan, in supporting this symposium in furthering UNU/UNESCO co-operation.

Japan is renowned for its rich and distinctive cultural heritage. It is also a country that, in little over a century, has become a world leader in science and technology, currently investing in scientific research and development the highest proportion of GDP in the world - around 3.0070. How Japan has managed to maintain so many of its traditions while becoming one of the most developed and prosperous countries on earth is a source of perpetual fascination to the West.

The Chairman of the Japanese Institute for Political Studies, Professor Rei Shiratori, has made a connection with the Japanese tradition of consensus, with the fact that 'When the Japanese find a sharp difference in attitude or opinion on a subject, they will first try not to pay attention to the difference (but) to discover and consolidate the common ground between them'. The same genius for conciliation is perhaps apparent in the Japanese Government's Guideline for Science and Technology Policy (1992), whose objectives

include 'the construction of an attractive society where people can live with peace of mind'. It seems to me auspicious that this Symposium ,should be taking place in a country with a unique experience of assimilating, applying and promoting science in the context of an ancient Eastern culture.

The Symposium is being organized in the framework of the commemoration of the 50th anniversary of the adoption of UNESCO's Constitution. I should add that this month will also mark the 20th anniversary of the founding of UNU. I take this opportunity to congratulate UNU on this anniversary and to ensure its Rector of our wish to strengthen our work together in the years to come. In celebrating our own anniversary, we have been concerned to use it as a chance to reflect on the fundamental purposes and continuing relevance of our mandate. I cannot think of any issue more central to the mission of UNESCO than the relationship between science and culture and the possibility of their convergence in a common path.

We are too much in the habit of speaking as if science and culture were essentially different. After all, one of the greatest scientists - Albert Einstein - once said: 'The whole of science is nothing more than a refinement of everyday thinking'. The scientific method is simply the habit of moving, through careful measurement, from observed facts to general principles. It is the extraordinary impact of this method on the world and our vision of it that has come to make us think of science as a thing apart. Its effectiveness in those areas where it is applicable has tended to devalue other modes of perception and to dictate the focus of human interests. Yet even in science, creative intuition - the incommensurable leap of the imagination - is vital to any significant achievement.

Knowledge is what we discover, invent, discern. Creative thinking, invention, imagination, innovation, looking beyond the appearance of things are the distinctive capacities of the human being. Physics and metaphysics are different but not contradictory spheres. The essence of human beings, the defining quality of the human mind, is freedom - which is why dogmatism and fatalism are equally unacceptable.

This is the reason why it is so important to empower all human beings to decide for themselves, to make their own choices, to master their own destiny, to design their own future. The key to empowerment is education - including the excluded and reaching out particularly to children everywhere. Education is essential to solving many of the global problems with which we are confronted, such as runaway population growth, poverty, migratory pressures, environmental degradation. It is also the means whereby all citizens can participate in the life of their society, whereby democracy can take root and flourish. Scientific and technological education in particular can help to bridge the gap between science and culture, can contribute to the development of a broadly-based scientific culture.

We need to distinguish carefully between the acquisition of knowledge and its application. As my old mentor Bernardo Houssay used to insist: There is no applied science if there is no science to apply". To know is inherently harmless; to apply knowledge can be harmful. Half-a-century of nuclear deterrence and growing environmental dangers have

sharpened awareness of the potentially “disastrous consequences of the misapplication of science, Scientific progress in areas such as human genetics is confronting humanity with disturbing existential choices. And the tragic spectacle of poverty and human suffering in the world is a permanent reminder that scientific progress in itself is no guarantee of universal well-being. The misapplication of science, or the failure to apply its benefits wisely and equitably, have resulted in a state of affairs where 20% of inhabitants of the planet enjoy 80% of its resources. The resulting asymmetries - a grave threat to peace - together with the destructive power unlocked by modern science place in jeopardy the future of our planet, the rights of future generations which under the UN Charter we are committed to safeguard. These threats, dilemmas and failures all argue powerfully for a closer linkage between science and ethics.

As you know, UNESCO has created in International Bioethics Committee chaired by Madame Noëlle Lenoir, which is addressing the moral issues relating to the human genome. A declaration on the human genome will in due course be submitted for approval to the General Conference. It is my intention to enlarge the scope of this work in bioethics and to propose to the next General Conference the creation of a World Committee on Scientific Ethics.

Another ethical aspect of the application of science concerns what I like to call the ethics of time. We live in a reporting society, which multiplies the diagnoses but hesitates to undertake a course of treatment. There comes a time when, in the face of all the vested interests and economic pressures, we must apply a treatment. The perfect diagnosis - I like to repeat - is an autopsy. We have an ethical responsibility to act and to act in time. This applies to peace-building and the harnessing of science in the service of human welfare. And here we should note the preventive treatment tends to remain invisible to the extent that it is successful. The media highlight our misfortunes; our contentments do not usually appear on the screen. We must do more to make visible the invisible for it is in this area that the potential for progress lies. As the 1987 Nobel Peace Prize recipient Professor Lown said (speaking on behalf of International Physicians for the Prevention of Nuclear War): ‘Only those who are able to see the invisible are able to do the impossible’. More and more, the United Nations must make the largely invisible task of preventive peace-building - as distinct from peace-keeping once conflict has broken out - the focus of its efforts. And to be successful it must involve everybody in this supreme enterprise.

A number of UNESCO conferences in recent years have explored the different aspects of the relationship” between science and culture. The Venice Declaration that emerged from the symposium ‘Science and the Boundaries of Knowledge’, organized with the Georgio Cini Foundation in 1986, stressed the need for truly transdisciplinary research within and beyond the sciences. In 1989, the Vancouver symposium on ‘Science and Culture for the 21st Century’ highlighted the new vision of man inherent in contemporary science and declared: ‘It is within the framework of the converging images of man provided by recent scientific and cultural developments that we look for visions of a future that would allow man to survive in dignity and harmony with his environment’. In 1992, the Belem symposium on

eco-ethics held in Brazil just prior to the Earth Summit spelled out the need for a new moral code respectful of the complex interrelationship between science, culture and nature. Most recently, the major philosophical meeting held this year at UNESCO on the theme 'What We Do Not Know' produced a wealth of observations on the distinct but ultimately convergent attempts of science and other modes of perception to part the 'veil of unknowledge'.

Concern with the closer integration of science and culture is at the heart of UNESCO's programmes and of its draft Medium-Term Strategy for 1996-2001, to be submitted to the General Conference of its Member States this October. It is reflected in efforts to rethink the development paradigm to encompass all aspects of culture, to harness science more effectively in the service of human well-being, to follow up in UNESCO's fields of competence the recommendations of UNCED, to explore and advise on the complex issues of bio-ethics, to integrate science as a basic component of education for all, and to promote and practise interdisciplinarity throughout the full range of UNESCO's programmes.

Central to this endeavour - as to all UNESCO's other activities - is the protection and promotion of human dignity. Respect for human dignity implies respect for the rights of individuals in the fullness of their being, In this way, the integration of science and culture is bound up with wider questions of human rights, democracy and tolerance. To reintegrate science with aesthetics, ethics and religion is to dissociate it from impoverished conceptions of man (and woman!), from positivist philosophies of knowledge, from the will to exercise domination over human beings or nature. It is to ensure that science is placed in the service of UNESCO's ultimate goal'- a culture of peace.

The culture of peace - of which we are to hear more from Professor Ohe - means putting into practice the promise made to future generations in the UN Charter; it means preventing conflict, eradicating illiteracy, narrowing the gap between the haves and the have-nots, alleviating poverty, stopping investments in armaments, ending the perverse refinement of nuclear weapons, being permanently mindful of the interests of others. We celebrate this year of the United Nations Year for Tolerance. Peace requires that we recognize and accept in others that endless diversity of viewpoints which is the corollary of human creativity. It means forging in the minds of everybody a sense of openness, of consideration for others, persistent attitudes of non-violence. Diversity - or, more precisely, the biological and socio-cultural uniqueness of every human being - principles of justice, freedom, equality and solidarity enshrined in UNESCO's constitution, are our unity. Working for the convergence of science and culture can contribute to the development of a much needed epistemology of tolerance in the minds of men and women. I wish this symposium every success in its reflections.

INTRODUCTION

‘The end of the mechanistic view of nature
towards a new age of enlightenment’

‘Unity in diversity’ - a holistic vision’

The Venice Symposium (1986) was organized by UNESCO and the Cini Foundation and the Tokyo Symposium (1995) by UNESCO and the United Nations University (UNU). Were they two of the ‘most important symposia of the century’?

I am inclined to think so. The first was marked by the famous ‘Venice Declaration’, which restored to Tradition the full nobility of its reputation as compared with science. The Declaration was a milestone in the transdisciplinarity movement, which has now become international in scope.

The Tokyo Symposium issued a short ‘Message’ addressed to present and future generations: *Our message from Tokyo this September 1995 is, therefore, that the time is ripe for a new age of enlightenment*’. This poignant and lofty phrase, worthy of a great council, clearly establishes a watershed between the past and a new future.

As in the case of the ‘Venice Declaration’, the ‘Message from Tokyo’ reiterates the fundamental importance of Tradition by referring, *inter alia*, to Buddhism: *‘Our message reflects the concepts of Mahayana Buddhism, which present a powerful holistic vision of the future of human existence within nature’*.

Thus, the following are reasserted:

1. A holistic vision of reality.

This new holism *recognizes the unfoldment of the whole in” its ‘parts’*. In other words, that the part and the whole are the same surfaces of a single mirror and distinctly convey the essential aspect of all Traditions, i.e. the unity of the microcosm and the macrocosm.

2. The convergence of science and traditions.

As in the ‘Venice Declaration’, the ‘Message from Tokyo’ stresses this convergence between science and tradition by choosing as an example the tradition of Mahayana Buddhism. After all, *‘the originators of quantum physics found that there exists in the universe an order of wholeness’*. Example: quantum ‘inseparability’ (two particles are linked in the universe independently of the distance and the time which separate them).

Another example: the non-dualism of any quantum particle which is simultaneously corpuscle and wave.

While it is still difficult to evaluate the implications and the importance of this common 'holistic' vision, it can be held that science and tradition ennoble each other. Although always defined by objective observation, science is apparently becoming receptive to the meaning of phenomena, whether that meaning is philosophical or spiritual.

A number of paradigms stem from this fact:

1. Unity in diversity.,

This principle is fundamental, not only for the preservation of biological life but also for the '*preservation of cultural identities and values through respect for diversity*', respect for '*differences such as those in ethnicity, religion...*' and, as a corollary; the '*promotion of a caring society*', thanks in particular to women, who '*are a fundamental force*'.

2. Individual freedom.

'Each woman and man is responsible for his or her own destiny'.

3. Creation of a culture of peace.

4. All these 'rights' concern present and future generations '*in line with the concept of generational continuity*'.

5. Rights which take on their full meaning in the context of the '*Universal Declaration of Human Rights and the Convention on the Rights of the Child*'.

This humanistic and spiritual vision is in keeping with what the great future change should be. Change in the sense of a radical shift in the values that have dominated the planet over the last three centuries. To put it plainly, a rejection of the mechanistic science that separates and dualizes observation.

. Rejection of the '*concept of blind progress that favoured a materialistic view of civilization*',

. Rejection of a '*technological concept of "progress" through the standardization of civilizations*',

. Rejection of the '*mechanistic and value-free view of nature*'.

The word 'Rejection' which I use, while it does not appear in the 'Message', is nevertheless implicit in it.

To put it plainly, the mechanistic and strictly rational 'Technoculture', which does not take into account in its approach either the wholeness of phenomena or their fundamental unity, has had its day.

That a symposium organized by UNESCO and the United Nations University should so clearly announce the end of a system and all its consequences for the past 300 years is, I think, of major importance.

The dualistic mechanical view out of keeping with the new vision of reality arising from quantum physics and planetary globalization. 'Technoculture' without humanistic ethics has amply demonstrated its power to erode values and its unlimited devastating effects on the living world, which have caused humanity to move from a state of living to a state of survival.

Consequently, this future oriented symposium has played its part to the full in highlighting the end of local causality as a prerequisite for the advent of a new world of 'enlightenment'.

All the momentous, paradigm shifts - those of Copernicus, Galileo, Newton, Einstein, Planck and Bohr - took some time to become established. The birth of quantum physics dates back to 1900. A century has passed, and only now is its effect beginning to be felt, even though most of the structures inherited from the nineteenth century retain strong bastions throughout the world. In other words, change happens slowly.

If the 'holistic' vision stands a chance of asserting itself more swiftly, this is because the survival of the planet can only become more precious under the pressure of the rapid collapse of the means of existence on Earth. Hence the unavoidable urgency of such a change.

All these ideas were expressed in many papers and discussions during the symposium. Scientists and philosophers from eight countries discussed and signed this 'Message', which takes on its full significance if we understand its prefatory sentence: *'Only those who see the invisible are able to do the impossible'*,

Michel Random, Rapporteur

MESSAGE FROM TOKYO

‘Only those who see the invisible are able to do the impossible’

Final Communiqué of the Symposium

“Science and Culture: A Common Path for the Future”

Tokyo, 14 September 1995

Mechanistic science, which reached its peak in the last century, sought to separate the dispassionate observer from the object of inquiry. This led to a concept of blind progress that favoured a materialistic view of civilization. Thus, today we can identify two competing ideologies: a technological concept of ‘progress’ through standardization of civilization, as opposed to a preservation of cultural identities and values through respect for diversity. Behind these powerful ideas is the untested belief that ‘science’ and ‘culture and tradition’ are incompatible with each other and separated by an unbridgeable gulf.

We believe that this apparent incompatibility is due to the fact that for the past 300 years - only about one ten-thousandth of human existence - Western science has moved away from earlier more holistic views of nature. This movement in science was characterized by a mechanistic and value-free view of nature that produced material, technological abundance, but led to increasing specialization and compartmentalization.

During the twentieth century, on the basis of empirical findings, leading scientists - not theologians or philosophers - began to reverse the assumptions of the previous three centuries. This reversal was led by the originators of quantum physics who found that there exists in the universe an order of wholeness that is akin to those occurring in the earlier views that science has abandoned.

Our message from Tokyo this September 1995 is, therefore, that the time is ripe for a new age of enlightenment in which universal human values will once again unite and orient the endeavors of humankind. In these endeavors women are a fundamental force for the promotion of a caring society by their participation in the creation of a culture of peace, one in which each woman and man is responsible for her or his own destiny. However, care must not be limited to those living today. To complement the Universal Declaration of Human Rights and the Convention on the Rights of the Child, and in line with the concept of generational continuity, we call for an extension of those relevant rights to future generations.

Central to the theme of this enlightenment is the paradoxical complementarity of unity and diversity. Hostility to, rather than tolerance of, differences such as those in ethnicity, religion or colour brings not unity but despair. The holistic precepts, naturally arising from the new scientific awareness, in conjunction with a resurgence of traditional views, can be the basis for the attainment of perpetual peace.

A core characteristic of this new enlightenment is an appreciation of a fresh approach to unity in diversity. Natural and social scientists have long held an idea that first took hold in the visual arts: the whole is greater than, and different from, the sum of its parts. According to this idea, new attributes emerge as components come together in the special arrangements that signify a whole. But, science now has uncovered the existence of a totally different holistic aspect of the universe. This new holism recognizes the unfoldment of the whole in its 'parts' and the distribution of the 'parts' over the whole. Thus our message reflects the concepts of Mahayana Buddhism which represent a powerful holistic vision of the future of human existence within nature.

Participants

Santiago Genovès, Universidad National Autonoma de Mexico (Mexico)

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Edgar Morin, Director of Research, Centre d'études Transdisciplinaires, CNRS (France)

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Aloyse-Raymond Ndiaye, Director, Fonds international de coopération universitaire à Montreal (Senegal)

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PURSUING A CULTURE FOR PEACE

by Kenzaburo Oe

I am very honored to have this opportunity of speaking at this occasion commemorating the 20th anniversary of the United Nations University (UNU) and the 50th anniversary since the founding of the United Nations Educational, Scientific and Cultural Organization (UNESCO). Actually, my thoughts about speaking here are very complicated, as I was motivated by my very earnest feelings that go beyond my great pleasure at being given this opportunity.

I must say that the UNU is a very attractive venue for me. Like most novelists who often have an anarchical nature at heart, I did not have a deep relationship with universities. This may even seem a little incongruous as the happiest period of my life was when I was a university student, especially studying with Professor Kazuo Watanabe who was specialized in the French Renaissance. However, I graduated with a firm determination never to teach at a university. In a sense, I simply wanted to run away from universities.

Even for a novelist with this background -- and not wishing to sound alarmist -- I cannot help but be worried about what the near future holds for human beings. I think that many people in our present age live their lives with this thought in mind. And it was for this reason that the UNU, which engages in research aimed at the survival, development and welfare of human beings, and which organizes these projects on a worldwide basis, offers a venue that naturally attracts my interest.

Furthermore, there seems to be no fixed relationship or system involving teachers and students. Accordingly, my speaking here means exchanging ideas with leading specialists gathered together from around the world, or being given an opportunity to be a student of such scholars. And if I am allowed to call you my colleagues, this seems to be a place where I can ask questions as a colleague who has no specialty in any field. I say this knowing that a novelist appears to be fated by occupation to be a non-specialist.

After the Nobel Prize ceremony last year, all the winners -- except for those awarded the Peace Prize -- got together for a discussion. The theme was exactly the same as the purposes of UNU research. We talked at length about the possibility of human survival in the future, and how this must be made possible. This discussion was telecast to a worldwide audience.

However, I wonder if this TV program proved to be a substantial disappointment to the many people in the world who viewed it. Because I am not a specialist in any field as I noted earlier, I was one of those who made fewest remarks among the prize winners who participated in this TV discussion. Therefore, in fact, I feel I am not really entitled to make critical comments like this.

However, I definitely count myself among the human beings who think deeply about the future of mankind. Moreover, it was clear that I was one of those whose hearts were heavy with worry as I sat at the discussion table. This, I think, gives me some justification to make comments about this conference.

Basically, the outline of our discussions was as follows. It was our common understanding that all of mankind is now facing great difficulties on a worldwide scale. Our views coincided on this point, especially in terms of the population issue as well as the environmental issue.

However, the view that mankind will eventually overcome these difficulties when measured against a long-term yardstick seemed to constitute a common feeling at the conference.

However, all participants were dubious or pessimistic about whether mankind can overcome them from a short-term standpoint, for example, a yardstick of five or ten years. Specialists in economics, physics and medicine all said that this would be extremely difficult. This conclusion gave rise to a bizarre atmosphere, as we were essentially saying that there was hope over the long term, but that the short-term perspectives were hopeless.

As a novelist and a man who is entering my senior years, I thought long and hard about this -- although very subjectively and unscientifically.

I first thought about what year marked the turning point between long - and - short term yardsticks, and if scientists, economists or doctors could specifically identify it. I asked this question of each winner, but didn't get a clear answer from anyone.

Therefore, I thought about this turning point myself. In short, I reasoned that efforts accumulated over a period measured by a short-term yardstick are connected to those on a long-term yardstick, creating what must be a turning point between them. If achievements cannot be made on the basis of a short-term yardstick until the year of the turning point, there would be no specific hope in the outlook for the long-term yardstick involving subsequent years. Accordingly, I tried to envision when such a turning point would occur.

The year I tentatively selected was 2010, or at the end of the first decade of the 21st century. It is the year I want to use as the criterion to connect the future in terms of a short-term yardstick and a long-term yardstick.

In my mind, I cannot set aside the issue a nuclear weapons in thinking about the present and the future, and feel this is also an obsession shared by all our contemporaries. And when I focus on the pivot point of the nuclear weapons issue, I can look back and see that all the major crises and transitional periods occupy a very short span of time.

The 1970s were said to be the age of detente between the United States and Soviet Union. This was less than 30 years ago. In the first half of the 1980s, a fierce anti-nuclear campaign arose especially in Europe, triggered by the deployment of highly accurate intermediate range missiles in the European theater by both the US and Soviet Union. As a result, the belief that a nuclear war could actually be won started to emerge in both camps, making the very real possibility that a nuclear war might actually break out even greater.

However, due to great efforts especially by US scholars -- among whom there may be many who participate in the UNU -- dire warnings arose about the possibility of a phenomenon known as 'nuclear winter'. These warnings continued to gain momentum until finally reaching their apex around 1982, prompting serious self-reflection about the folly of nuclear war on a global scale. And 1990 saw the end of the cold war.

In sum, during just 30 years at the most, the world has lurched between crises and narrow escapes over the specter of nuclear war. And after each crisis, a strange new status has emerged -- one which might be called 'post-cold-war syndrome' in that it seems the clouds of the next crisis are gathering. It is such a period in which we now find ourselves today.

Accordingly, I have to think of the future on the basis of the accumulated experience of the past -- a period that has been characterized by short-lived intervals of hope interspersed with the harsh realities of despair. It is for this reason that I cannot help but think of the year 2010 as the elusive turning point.

If the Second Strategic Arms Reduction Treaty, or START II, is properly implemented by January 1, 2003, the number of strategic nuclear weapons will be reduced to between 3,000 and 3,500. I feel that whether or not START II is successful is the major yardstick concerning the nuclear situation -- one that is closely intertwined with whether or not the outlook for the global elimination of nuclear weapons is reflected in specific programs in the year 2010, just seven years after that.

Turning to personal matters, I will be 75 years old in the year 2010, and will be preparing for how I will die. By then it will become clear whether I die in sadness and despair about the future of Earth and mankind, or blessed with the vision of our children and grandchildren filled with hope for the future.

And when I think about whether the actual year 2010 will be one of darkness or light, I am apprehensive that darkness may be the only way to describe it as far as the nuclear situation is concerned. This is because I think a new crisis is emerging in the ongoing nuclear tests by France.

Isn't the entire meaning of the Comprehensive Test Ban Treaty scheduled to be concluded next year essentially nullified by the French nuclear tests? Don't such tests mean we are going backwards toward the logic and passions of the cold war period -- evils that we thought had already been overcome. Instead I think that a crisis is upon us once more, and that this crisis is one index for projecting a future which sees the year 2010 as nothing but dark.

The nuclear tests conducted by France on the Mururoa atoll have already led to pollution throughout the entire Pacific Ocean. And the person who is showing us with definite certainty that such tests can lead to even greater destruction of the global environment is Captain Jacques Cousteau, the man who gave us hope with his beautiful films of the sea bottom.

Against the backdrop of this major crisis, however, a glimmer of hope can also be seen -- one that makes me feel that we are not entirely devoid of bright signs for the year 2010. What gives rise to this cautious optimism is the fact that the worldwide, grass-roots campaign against nuclear weapons that took place in the early 1980s is now coming back. For the first time since it originally emerged slightly more than a decade ago, a large anti-nuclear movement is again taking shape on a worldwide basis and involving masses of people. Fortunately, the reaction has been the same with respect to the nuclear tests conducted by China. When I think of the gathering momentum of this movement, I can see the year 2010 as one that also seems to radiate some hints of brightness with respect to the nuclear issue at least.

Now, what problems do these major current movements, i.e., the French nuclear tests and the worldwide reaction they have provoked, present to us Japanese? Essentially, they mean the need to once again consider the "nuclear umbrella" concept.

The notion of the nuclear umbrella formed a core ideology during the cold war period, and we were convinced that we could already see through its deception even during that cold war era. After the tests by France, however, the nuclear umbrella concept has re-emerged in Japan as an issue that has two aspects.

One reflects the thinking on the government side, and is trotted out by those who criticize the Japanese protest movements' against France. This thinking essentially says that, as Japan is protected by the nuclear umbrella of the United States, what right do the Japanese people have to criticize nuclear tests by France? Those who support this view have emerged even among Japanese political scholars. If a consensus emerges among Japanese people on the effectiveness of this nuclear umbrella, I fear it will lead us away from the elimination of nuclear weapons and towards a common recognition that favors the retention of the current nuclear status.

And retaining the current nuclear status means that the world and human beings will always remain in danger of annihilation. This is a concept that flies in the face of the hope for eradicating nuclear weapons.

When we broaden this domestic view to encompass Asia and if we are forced to conclude that under the nuclear umbrella of the United States, Japan must be considered hostile to China, we face a situation that completely shatters the dream of denuclearization in Northeast Asia.

This also deprives the Japanese people of any grounds for explicit opposition even if the Democratic People's Republic of Korea is armed with nuclear weapons. I consider this may truly be the biggest historical crisis that Japan is now facing.

When I think of this -- even if we focus on nuclear umbrella issue only -- can't it be said that the Japanese people have somehow failed to learn anything from 50 years of post-war experience? In other words, we experienced a major tragedy 50 years ago, and have painfully watched how the peace we finally obtained has been so easily jeopardized ever since. And all this while, have we used this experience to nurture our thinking or incorporate it in our culture? Even though the Japanese people suffered an enormous tragedy, I am afraid we have failed to create a culture for peace.

What we have to do from now is to add our current experience to that of our past and build on this a culture for peace. Why do we have to create a culture for peace? It is because we use it as a theme to educate our next generation. Building a culture for peace means reviewing our experience, and by doing so, determining the direction of education for the next generation.

In considering a Japanese culture for peace, I see three themes that must be pursued. One is the need to think of Okinawa -- which is exactly the place where people created a culture for peace in a true sense through their experience in major ground warfare. The second involves the experience of Hiroshima and Nagasaki, especially the significant endeavors of physicians who continue to think of how to treat victims of the atomic bombs and what hope can be given to them. They have continued to watch how people can recover from the tragic suffering of the bombings and how they restore themselves. What physicians in Hiroshima and Nagasaki have accumulated in continuing to support hope in the face of desperate misery is a perfect example of a culture for peace. It is this commitment that must form the core of education for the next generation after we have succeeded in assimilating it.

The third is the need for us to reconsider our responsibility for the suffering that was imposed on Asia from the standpoint of our culture for peace. This is especially necessary for the purposes of education. If we clearly reflect on our own conduct in terms of our responsibility for bringing war to Asia, and if we clearly compensate for it, we can, for example, oppose nuclear tests by China and be entitled to voice candid opinions against the suppression of human rights. However, the reason that the Japanese people cannot take such clear stands now is attributable to our failure to properly compensate China and other Asian countries for their suffering.

With these three themes forming the core, I think that it is possible for the Japanese people to build a culture for peace and to realize education in this culture for peace.

The late and much lamented German novelist Michael Ende once wrote that the word 'ship' was 'tewa' in Hebrew, and that 'tewa' also had another meaning of 'language'. Ende continued that Noah was saved by a 'ship' -- and by 'language'.

What the literati in the world need is, I think, to create a universal language -- one that is global in nature while still being deeply rooted in its own culture. The current Noah refers to all people, and we cannot be saved by anything other than a worldwide, universal language. At the same time, a 'very large ship' is also necessary. And I place my hope in the United Nations as the only entity that can now work as this 'very large ship'.

Speaking on a personal matter, I was encouraged by the International Year of Disabled Persons which the UN declared in 1981. Indeed, we fathers of handicapped persons were enormously helped by the effect that this declaration brought about in Japan. Moreover, the International Year of the Family in 1994 gave us an opportunity to think about families again. I feel that this has had a major impact on my literature as well.

For us, the fathers of handicapped persons, as well as for those who are determined to rebuild new lives based on the value of the family, the UN is of such importance. A United Nations that created the International Year of the Family and promoted it on a worldwide basis, or a United Nations that created the International Year of Disabled Persons and gave hope to us fathers of the handicapped -- isn't this the feeling that ordinary Japanese have concerning the UN?

Although we also have participants from the government here, I think our government is leading the public's attitude towards the UN in a special direction. For example, our government has taken the position that Japan should be a permanent member of the Security Council, and is guiding public opinion in this direction. Actually, these efforts appear to be going very well, as I think we have already reached the point in which a public consensus over this issue is taking shape.

By any stretch of the imagination, however, I cannot think that the call for Japan to be a permanent member of the Security Council arose spontaneously on the level of ordinary Japanese people. This constitutes a major problem in my view -- one that was reinforced by a recent experience when former German President Weizsacker came to Japan. Following his talk, the floor was opened to questions by the general public. One of the questions was 'How should the Japanese people participate in UN's PKO activities, and in what way should Japan render service to the UN from the aspect of its military capacity?' Mr Weizsacker sidestepped the PKO and military issues in his response, and instead simply said that the 'Japanese people can contribute to the population and environmental issues, which would be a major contribution to the UN'. I think this response also implied indirect criticism of the Japanese government.

At the National Municipality Conference, for Denuclearization Declaration held in Hiroshima on August 5 of this year, Professor Yoshikazu Sakamoto, who has long had a deep relationship with the UN, noted that the 'International Year' program has had an especially significant meaning among the things the UN has achieved. In other words, the UN's promotion of the International Year, which we accepted as the years for handicapped

persons and the family, was effective. In addition, he highly evaluated the special conferences that were held concurrently, and noted that both the International Year program and UN's special conferences were not state-oriented or single-country-oriented, but rather world-oriented. He mentioned as well that they were also future-oriented in the sense that they dealt with issues affecting the generation of our children and grandchildren.

Furthermore, although the themes taken up by UN's special conferences naturally included those related to politics such as the Disarmament Special General Assembly, it is said that they generally focus on economic, social and people-centered issues. And the fact that these conferences were held in parallel with world citizens' campaigns and NGO activities made an excellent point. The way in which the matter of human rights has gradually become a major issue is characteristic of the UN's special conferences, and is viewed as one of the results of what the UN's special years have achieved.

By taking into account the public protests against France's nuclear tests and what Mr Weizsacker pointed out', I think we need to clearly reconsider the expectations of the UN on the part of Japanese citizens.

Yet I am apprehensive about the Japanese government continuing to push an attitude that focuses on a statist approach concerning the UN, such as participating in the Security Council, rather than fostering the idea of creating a world order for citizens by citizens from the bottom up -- which is what Professor Sakamoto has stressed. I think the Japanese government must take an opposite direction from the one it is now pursuing, and it is this shift in direction that should be the most important principle in building a culture for peace towards the future.

The UNU is clearly world-oriented and future-oriented. It is the university which thinks of economic, social and people-centered issues, and moreover adopts an agenda of opening such research to ordinary citizens.

For those of us who are engaged in literature, and in a broader sense for those who are hoping for the creation of a new culture towards the future, i.e., a culture for peace, I think this is an organization that can clearly serve as a major guiding force. This is the reason why I sincerely hope for the success of this conference.

CULTURE AND THE ENVIRONMENT

by Jacques-Yves Cousteau

It was as early as 1950 that my little team became aware of the damage done since World War II to the undersea world we had been privileged to discover.

Prairies of algae, Posidonia, where all sorts of marine creatures lay their eggs--namely the nurseries of the sea-- were razed by small trawlers operating in the forbidden, shallow waters, while the thuds of remote dynamite fishing resounded as to herald the incoming, greedy hordes of all sorts of profiteers. Then polluting chemicals and radioactive wastes were dumped in the sea completing the attack on the marine environment launched by abusive fishing methods.

For 45 years, we campaigned for the environment, at a time when no one had any idea of what this word meant--45 years of diving, studying, publishing, speaking on the radio and TV--45 years at the end of which thousands of ecological associations were created.

But why would we protect water, fish, whales, birds, flowers, and their butterflies? Above all, we thought, for people. The idea to study the reciprocal influence of the water system and of human beings of various cultures gave birth to what we called 'ecosociology', a new field of science, and in 1986 our team started a new series of explorations called 'Rediscovery of the World'.

While I was thrilled by our new approach to socio-ecology, I could not help noticing that almost all the environmentalists of good will had practically no bond with the rapidly changing world around them, except with the very narrow field of their traditions and problems. I felt vaguely that the huge amount of efforts we had made, Tailliez, Dumas, Alinat, Falco, together with our scientists, our divers, our sailors, and our followers, had only created a sort of backdrop for an unforeseeable but inevitable doom. Meanwhile, the fate of the overexploited and polluted planet was beginning to inspire threatening thoughts.

I had the privilege to speak, here in Tokyo, at the First World Conference of Science Journalists, on November 10, 1992. In my speech, I mentioned the two major dangers threatening the future of our species: the population explosion and nuclear proliferation. Since then, the Cairo Conference did not induce countries to seriously consider the

overpopulation problem. And as far as the nuclear weapons are concerned, in spite of the recent reconduction of the ' Non Proliferation Treaty, France decided, last week, to resume underground nuclear explosions in the Pacific Island of Mururoa. By doing so, the French government showed that it had no intention to follow article VI of the NPT, in which the signatories of the Treaty confirm their mutual decision to reduce the number of atomic weapons, and stop producing new ones, until the entire world outlaws all nuclear arms, as they have outlawed chemical and bacteriological warfare. Such aberration was probably adopted and declared under the pressure of the almighty international nuclear lobby.

We must now get rid of the arrogance of such technocrats. I will always remember the visit I paid to President Pompidou to propose a restructuring of oceanic research in France. He listened to me for more than 20 minutes, he added remarks to show he knew very well the problem I was worried with... and while he congratulated me and shook my hand, he said, 'I agree with you, Cousteau, but never forget that a President of the French Republic can do nothing to counter these main services...'

Traditional ecology has heretofore succeeded in awakening popular awareness that air and water, the 'fluids of life' must remain pure, that rivers, lakes and coast-lines must be clean and that urban garbage as well as industrial waste have to be recycled or destroyed, which increases the cost but creates jobs. More and more governments have created 'Ministries of Environment' in the hope that these agencies would become appropriate watchdogs. The result of these efforts was obvious and elementary, but as necessary as teaching kids to brush their teeth. During these past fifty years, the people, at large, has been educated about consequences of negligence in daily behavior. This recent perception is becoming part of our new global consciousness, as when civics was introduced in most primary schools. But in this field like in many others, our only preoccupation has been short-terms results; for example, a new dam that does produce electricity y, is considered a success, even if it lowers the level of the water table and if it dries out essential flood-prone areas.

In fact, today, most politicians, practically all technocrats, all industrial cartels, do not even care at all about the long or very long term consequences of their decisions; and when they are confronted with essential, but difficult problems such as over population, they avoid the subject. Almost all heads of State swaggered at low cost in Rio. Only a few of them had the guts to participate in the Cairo 'Population Conference'! And none of them even took a few hours to think about the fate of future generations in the next 40 years!

The role of the 'New ecology' is to draw all the consequences of the philosophy of Jean Hamburger: we must first clarify what the precarious situation of humankind is, since we divorced from nature and, when this concept is fully realized, what vigilance will be needed to avoid a dire future. The new ecologists will add to the care of their predecessors for a clean, healthy environment; they will identify the snares on the road to a better quality of life and a fairer share of natural resources for all. But we will not limit our actions in curing symptoms of pollution, like taking aspirin for a headache: we will bring to light the very causes of each damage, as a doctor attempts to diagnose the origins of this patient's symptoms.

Poorly equipped to survive in a wild world, human beings took over the management of their own fate, from the whims of nature, into their own hands. The environment remains the major part of our preoccupations, but we must now include in our philosophy moral values, market economy, biology, thermodynamics, as well as the internal environment of human, or such new subjects as the ethics of genetic medicine.

The environment must no more be considered as just the surroundings, the theater set on which we conduct our lives; it encompasses our behavior, our ways and customs, our traditions, our language. When we have rejected for ourselves the Darwinian Laws, we have automatically become the protectors of all wildlife around us, and we must carefully listen to a number of warnings from nature. Dr. Peter Raven, Director of the Missouri botanical garden, writes, 'If we simply allow organisms to become extinct, we will not only have foregone the chance to preserve them, but we will never know how we might have used them, appreciated them, loved them, or done anything else with them'.

Thus, biodiversity is a major prerequisite for a sound, sustainable environment. When we speak of biodiversity, we mean diversity of species, of living communities, and mainly of genetic diversity, within a species, that guaranties the capability of adaptation. The greater the genetic variability, the more robust a species. Equally, the greater the number of species composing a community (we mean an ecosystem), the stronger the system to resist environmental changes. This powervul, natural bond between biodiversity of living communities and their capacity to endure adversity is a fundamental postulate and has recently proven to be dramatic. In Florida, Brazil, the USA, and the USSR, from 1972 to 1991, ambitious, gigantic farms using single species agronomy to improve efficiency, harvested famines instead.

The theorem of biodiversity applies, not only to ecosystems, but also to concepts (literary, musical, artistic, etc.). The multiplicity and the differences of and between cultures is the essential factor in the robustness of our civilization, and constitutes the irreplaceable treasures of humankind.

The most simple cultures have been the first to suffer the consequences of the arrogance and the pursuit of hegemony that has motivated history since antiquity. Sumer, Egypt, Mongolia, Greece, Rome and Many other super-states, enraptured by their own might, have laboriously destroyed a few other powerful civilizations, and crushed hundreds of more modest cultures, having thus impoverished our patrimony forever.

It is commonplace for developing countries, to state that modern colonialism has replaced guns with money. It could now be said, with equal plausibility that if cultural hegemony was to be sought, it is modern media that would replace guns--with the help of money.

We need cultural freedom, as we need the air we breath, a symbol of liberty that we refuse to buy. We need cultural diversity as we need gastronomy, unintelligible languages, freedom and democracy. We need time, not only to produce, but to think, create and enjoy life.

The protection of cultures goes well beyond a platonic declaration of intentions, well beyond a derisory communication skirmish between Goliath and David symbolizing images against words, the 'Me. Generation' against mutualism, competition against stimulation.

Whatever marks these ripples have left in history, we now have to make sure that there will be an awakening of global public opinion, to save the mixed borders and the flowering profusion of our motley cultural jungle.

It belongs to the 'New Ecology', to promote the difficult but essential protection of the remaining weak cultures scattered around the world.

In the course of my adventurous life, I have been the witness of many cultural shipwrecks. Most of them tragedies resulted from the confrontation of two peoples, of two different ways of life, one of them declaring unilaterally its superiority. But the means used to perpetrate such crimes varied greatly.

When my ship Calypso arrived in Terra del Fuego in 1972, I tried to get acquainted with the Fuegian Indians name UNAS, who had been described to me several years before my Father Lempereur. I found that there was only one UNA left, a woman aged 82. All other UNAS had been hunted by guns as if they were game! The pretext'? Darwin had written that the UNAS were closer to animals than to men. . .

In Chili, in 1973, we studied the tradition and the original, monochord music of the remaining 37 Kawashkars. Fifteen years later, there were none left. They had been employed as hard labor workers, such as miners, and had been unable to adapt.

The Niassi, a naturally belligerent people, are living on the island of Nias, west of Sumatra, in Indonesia. We anchored in the Bay of Lagundi and found colorless citizens of Indonesia: they had kept no memory of their ancestral culture. The elders had created monuments of stone to leave a lasting race of their passage, but one century ago, their chief had been converted by missionaries and most of their legacy had been eradicated. The intruders had annihilated the Niassi way of life faster and more completely than centuries of war.

In Brazil, the Yanomami are still persecuted and slaughtered just because gold has been found in their traditional province.

The Mentawai, from the Indonesian island of Siberut, still proud of their independent way of life, are threatened by a more unexpected and insidious menace; a menace that we have always considered to be a blessing-education, which, in this case consists of replacing a weak culture by a stronger one, and which, while it impoverishes our global civilization, instills new blood in a people's culture, that would have been eliminated anyway in a few decades.

Finally, the most significant example for the rest of the world, is the self-genocide of the Pascuans, a tribe of Polynesians that had settled in 700 A. D. on the small, virgin and exuberant tropical island, Easter Island. In only nine centuries, Pascuans had proliferated from 200 to more than 20,000 people, having exhausted the resources of their small world, they starved, revolted, and destroyed their own culture, as a solemn warning of how quickly overpopulation can turn a flourishing culture into a precarious struggle for the survival of a few.

These examples of cultural waste teach us a lesson: we have only one way to keep our proud civilized world flourishing; we must protect its diversity, as much biodiversity y, as cultural variety. We must refuse to see patrimonies sold off as consumer products.

But, since our irreversible divorce from nature, the road to of our future has become a highly dangerous track. By adopting proudly entirely new moral values, we have unconsciously planted mines on our road; to detect and neutralize themes, we need not only a permanent watchfulness, but also the help of the latest science and techniques.

Recently, humankind came across an unexpected snag. To replace the harsh law of natural selection by justice, by primacy of the individual, by principles of equality and brotherhood, was a daring rational choice, not an instinctive drive. In the complex structure of our DNA is still engraved the tendency to submit our behavior to the principles that have made the success and diversity of life. The moral laws that we have invented, professed and adopted will take a long time to infiltrate our economics; they remained relegated into the background, by the menaces of the cold war.

When the Soviet Union collapsed, the caciques of the western stock exchanges brandished as a revealed dogma, the superiority of liberal economics . . . in a few months, the community of speculators became the ruthless, anonymous, universal dictatorship of the so-called 'market economy' that today governs the world, high above any national sovereignty.

The painful, difficult times of the occupation of my country by the Germans gave me. a personal insight into the fascinating history of dough. My family, in Toulon at the end of the war, published the following ad in the newspaper: 'Exchange ten meters of garden hose for a pregnant rabbit'. The deal was made, and we often ate rabbits. Money had nothing to do in this picturesque barter, but it satisfied both parties. Besides, during the war, to buy essentials, it was often more difficult to obtain the coupons than the money that was supposed to represent the value of our frugal rations.

The war and the after-war have been periods of destabilization, during which the social--and even the moral--signification of money was put into question. The black market, the nouveau riches, are inevitable by-products of crisis--such as the one I lived in 1939-1945 or the chaos the countries of Eastern Europe are submitted to since the collapse of communism. The ruins provoked by wars or by revolutions, lay bare popular sufferings as well as the appetite and the insolence of profiteers. But in very short times, misconduct gets organized, or concealed, and everything enters into an apparent order. Money becomes again the 'third fluid of life', but is, in reality, the starting point of social problems, of moral conflicts, of growing injustices, of geopolitical divorces and risks of war.

Historically money, under its most diverse shapes, seashells, coins, warrants, bills, checks or credit cards, has facilitated exchanges since Neolithic civilizations, thus accelerating the development of what we call progress. But money, as an abstract symbol of trade, was, at the origin, submitted to the 'labor standard', when humanity had to earn their bread at the sweat of their brow.

In fact, wealth, the ideal tool of domination, has always been based on the work of others; but nowadays, less and less labor is necessary to produce consumer goods, and a magic-metal-gold-shining, non corrodible, and rare has replaced work as monetary standard. Accumulated in the vaults of national banks, gold, a symbol for continuity, reassured populations. Not for long. The very stability of the yellow metal was in the way of speculators, whose power was growing with the spread of telephones and of computers. Today, money has lost all concrete signification, even though liberal economy and the market dictatorship took over the entirety of human activities. Money is the common denominator of our lives. The economic slumps, inflation, unemployment did not only affect the well-being of citizen; they often incite life or death problems for the most underprivileged or for the elderly. Such scourges completely escape from the forecasts of the theoreticians of economics, who are naturally the firsts to explain in detail, but only after the event, the collapses they have never been able to announce.

Meanwhile, the system we live in, does not hesitate to assess, like for animals, the value of a just-born baby to human beings at each stage of life. The same indecency supported by stupidity, leads theoreticians to include sickness, handicaps, disabilities, and other infirmities into the positive part of national income. In this field, recently, an insurance company regretted the introduction of airbags to protect autodrivers in case of accidents, because without the bags, the drivers were killed, which costs less to the insurance company than a handicap for life. Not to be forgotten in this escalation of absurdities, some medical experts explained that smoking was good for the economy, because a high percentage of smokers would die fairly young from lung cancer, which would avoid the cost of medical care in their compromised old age.

Meanwhile, in only 10 years, the age of Madame Calment, the oldest human being, the population has exploded eight times, from 700 million to 5 billion 600 million, the natural resources are quickly depleted, the climate of the earth is warming up, over one million species of plants and animals have been exterminated, the human community is divided in two, the rich countries who get richer every year and the poor ones who get poorer and poorer. The 'new ecologist' must not be satisfied by just cleaning a river or adopting a baby seal: our new job is not to be pharmacists to sell aspirin and cure the symptoms; today we must act as doctors, making thorough diagnosis of the sicknesses we suffer from and ones we identify the origins of our evils, we must fight the causes with all our strength.

The economic upheaval we are submitted to, is in a shattering contrast with the intentions humans have clearly expressed in divorcing from nature. An irresistible genetic drive to return to the harsh laws of natural selection, has succeeded in taking over the economic field, conferring discretionary powers to an anonymous, ruthless dictator, the faceless Mister Market.

This dangerous transfer of power is in fact a return from civilization to wildlife, from moral standards to the cult of sheer strength, from democracy to unidentified dictatorship. It would be easy to demonstrate that market economy is not necessarily a consequence of a perfectly liberal economy, for the same reasons that democracy cannot be confused with anarchy.

Mister Market has allies in unexpected fields, like the religion of technological 'progress', the confusion created by the proliferation of information, and the invasion of virtual concepts into the real world. In the economic field itself, reality is losing ground. What else are 'junk bonds', 'futures', or 'derivatives' than a way to speculate on virtual, inexistent concepts, at the expense of those tax paying citizens that are exploited and tranquilized by a controlled permission to gamble at the real stock exchanges. If we do not intelligently react by simultaneously adopting the advantages of science and technology while refusing to be drenched and flooded by information highways organized to generalize one single way of thinking, one single way of life, while pretending to protect the variety of opinions and of cultures! In short, the abuses of the triumphant 'free economy' have resuscitated natural selection at the stock exchange as mercilessly as in the jungle, and have unleashed fierce competition instead of encouraging mutualism and stimulation.

But apart from philosophical reasons, the new ecology has a long list of reservations about market economy. Market-based economics is primarily concerned with quantifying the flow of goods or services and defines value according to what people are ready to pay for those goods and services. It amounts to a receiver-based system of values, contrasting to one that would quantify the value according to what was involved in the creation and the production of consumer objects. If a 'production based' system of values was adopted, we would find such things as forests, creatures, clean water or education to be of great value. Of course they are of great value even though people today are not willing to pay much for them. Clearly, our present economic system of ecological value is flawed.

Another reservation is made in our new approach to environmental protection: economy is defined as a circuit. Work and goods, capital and money circulate from enterprises to homes so that everyone gets richer. This postulate serves as the principle for all evaluations of economic situations. But economy is not a circuit. Non-renewable resources run out while waste piles up. The precious goods vanish while valueless rubbish grows inexorably.

The neo-classic market equilibrium can only exist if the participants are already granted their subsistence, as happens in a successful agrarian community. But when humans can no longer choose between work and leisure, the picture is very different. Professor Georgescu Roegen adds: the real goal of 'production' is not the 'product'; it is, in fact, an immaterial 'fluid', the joy of living.

The new ecologists can also remark that, according to the second law of thermodynamics, time and all processes in the real world are irreversible. The reason why we still have illusions about 'balanced economic circuits' or 'balanced market prices', is because, during the past century, gigantic sources of concentrated but exhaustible energy were discovered and we forget that they are non-renewable. Our type of economy cannot exist without concentrated energy. In this field, shortages cannot be cured by manipulating prices, and most of the potential buyers of such raw sources of energy cannot participate because they are not yet born- 'future generations'. Accordingly, today's market prices confirm the dictatorships of present times over the future. And a multidisciplinary analysis shows that ecology and market economy are difficult to reconcile.

The majority of the theoreticians or the pioneers of runaway economy, Adam Smith, David Ricardo, John Magnard, Keynes, Milton Friedman, died before they realized that many important resources are not renewable.

In order to extend irreversibly to all nations the ice cold dictatorship of Mister Market, a last great stride had to be made: about the famous Gatt and other Uruguay rounds. In spite of understandable resistance, the package was adopted which means that most governments have already capitulated and sacrificed the very sacrosanct national sovereignty, that they constantly brandish to avoid consensus in practically all occasions of international cooperation.

However, Mister Market, in his rush for global hegemony, eventually makes mistakes. In our world, where salaries and customs vary greatly with the degree of poverty, while speculators are allowed to play yo-yo with currencies, industrial and commercial competition is boosted to an unacceptable degree. To remain competitive, most major enterprises have no choice, but to reduce their work force. Unemployment grows first in countries where salaries or social security prices are high, but will inevitably generalize. Trapped in this imperative 'competition highway philosophy', governments are plagued by the inevitable tide of unemployment, and can only propose demagogic Band-Aids.

Does competition, the driving force of our uncontrolled economy, contribute to the quality of life? A closer look leads to unanswered questions: Efficiency? What for? To boost wealth of the rich third and sacrifice the poorer two thirds of humanity? Efficiency to favor currency speculators? Efficiency to increase unemployment, to create millions of jobless and homeless in the most affluent countries? To waste essential resources here, that are lacking elsewhere? Efficiency to provide youngsters with only one goal in life: get rich? The way we misappropriate our 'efficiency', only results in a growing deficit in the yearly balance of payments for third world countries. More than a century ago, John Stuart Mill wrote: 'I know not why it should be a matter of congratulation that persons who are already richer than anyone needs to be should have doubled their means of consuming things which give little or no pleasure except as representative of wealth'. As long as the free market economy will not be far more controlled and submitted to our new set of world values, it will be as cruel, as unjust, and will kill as many people, as the laws of the jungle we have once and for all rejected.

The international trade of weapons, hypocritically enters the free market's set of arguments to flout all moral principles. The armaments market is the trade of death, nothing else. It has suddenly increased in the aftermath of the Gulf War. A painful example is that of Vaclav Havel, then the famed and respected President of former Czechoslovakia. In a book published in Prague in October 1992, Havel wrote, 'I am supposed to be a naïve dreamer, who wants to reconcile the irreconcilable, politics and morals... the real politics is at the service of the people, and of future generations. Its ground is ethical, as it is the only materialization of the responsibility of all towards all'.

Full of enthusiasm, I went to Prague and interviewed Havel on camera. 'How come?' I asked him, 'after just writing these beautiful words, that you decided to boost the production of arms in the Skoda factory?' Obviously embarrassed, Havel tried to justify the decision by unemployment and economic pressures, Mister Market had defeated archangel Gabriel. If a hero, like Havel, in charge of a recently liberated country, had to submit to market forces, how could anybody convince less idealistic leaders to flight uphill against spreading poverty and exclusions in the third world and-surprisingly-in the rich countries as well?

The intentional community, under the leadership of UN's secretary general, has organized a series of 'Summits' in Rio, Cairo, Copenhagen, and soon Beijing, in which most of the leaders of the world have or will participate. A thorough analysis, made at the global scale, during these Conferences, resulted in a number of conventions, and a crowd of recommendations to which as many as one hundred leaders generally subscribed. The environment must be better protected, they said, the economy must grow; non coercive measures must be taken to slow the population explosion; all these beautiful principles are adopted with very little opposition. But when it gets to tune our actions to our principles, the consensus collapses. Issues remain in stagnation. The green house effect gases, mainly carbon dioxide and methane, which may accelerate the warning up of our planet, are only reluctantly trimmed, in spite of the Rio Summit's decisions. The overall ODA (Official Development Assistance) from affluent to needy countries, generally remains token, and even recently shrinks, while such meager allocations are often misused to increase local military budgets rather than education.

We must have the courage to face a new situation, that has no precedent in history: either the leaders of the world, who have all directly participated in the summits of Rio, Cairo, Copenhagen and Beijing, understand that what is at stake is literally to save the human species from an impending, dreaded disaster, that would destroy our civilization in less than one century, leaving our impoverished Earth at the mercy of a dozen bilion humans, returning to wilderness.

At the level of international summits, a war has been declared, against poverty, exclusions and special interests. It would cost money, a large amount of money, much to much to be attained by charity or personal sacrifices. Besides, most of the countries, struggling with their own economic competitions and prisoners of the global economic system, have no possibility to share . . . even as little as the proposed 0,7% of their GNP...

Even if we shrug pessimistic outlook off, and if we reassure ourselves, relying on the proven genius of our species, no solution has yet been found to such problems as the one Ismail Serageldin, Vice-president of the World Bank, once outlined to me: 'How should we share our limited environment, between people needing more and more space if only to survive, and another indispensable community named wildlife?'

To have a chance to meet successfully the formidable challenge outlined by the quator of summits the UN has brought together, we must create a Center of Moralists, Philosophers and Scientists, to evaluate the very maximum of resources our planet can provide to a population of ten to twenty billion humans, and how space as well as goods, should be shared between people and wildlife, A world policy inspired by exobiology and ecosociology is the only one capable to stem our perilous cause towards a golden age, and protect cultural and biological diversity, while proudly hoisting the colors of humankind.

THE RETURN TO NATURE AND THE CULTURE OF PEACE: AN ALTERNATIVE PHYLOSOPHY

by Alyose Raymond Ndiaye

As we celebrate the fiftieth anniversary of the United Nations Organization, two problems, in my opinion, seem to preoccupy our contemporaries: the survival of mankind and the proposition of perpetual peace. The first one suddenly irrups in the universal consciousness at the time when the whole planet is threatened by an unbridled exploitation of nature. Indeed, it is the concern for the environment which awakens us to the danger that threatens us, ourselves as well as future generations.

As regards peace, which theme can be of more relevance, of more significance, when we know that fifty years ago, as a result of the war, the first atomic bomb exploded above the country which welcomes us today. Conflicts between and within nations show us, even today, the dreadful image of peoples which perish, of regions which are devastated, of ethnic groups and cultures which agonize before disappearing. We would briefly refer here to the conversation of Elie Wiesel with President François Mitterand. Asked about the possibility that the 'planet blow up', the French President gave this reply: 'The nuclear weapon, as destructive as it may be, would not suffice to destroy the earth'. We should however agree with Elie Wiesel that an accident is always possible. Although we notice that there is presently a backward trend with respect to world nuclear conflict, we are not for that reason reassured on our future.

The question of peace or the future of mankind and the question of nature are therefore not unrelated. Man and nature suddenly appear as **interdependent**, linked by a common destiny, two realities equally recognized as **legal subjects**, according to ideologists, and which our modern civilization has decreed that they should be kept distinct. We need to reconsider the relationship between man and nature, as the survival of mankind depends on this, both from the point of view of ecology and international relations. We need, as Michel Serres wrote, to decide peace between us in order to safeguard the world, and peace with the world to safeguard ourselves.

My main purpose will be to show that the return to nature contains the seeds of peace which only require to grow, if only we make the effort to cultivate them.

You will allow me to refer to the African experience. We know the state of that continent. I remain convinced that the lessons which we can learn from the present situation in Africa have a universal value. My intention is therefore to submit to your judgment three questions to which I shall endeavour to reply: what is culture, and what do we mean by return to nature? What is its relationship with culture and with peace?

Modern thinking has concluded, with Descartes, that man and nature are totally distinct. The consequence of this important assumption in the history of modern thinking, has been the 'oblivion' of nature. 'For almost half a century', as Michel Serres wrote again, 'our acosmistic without cosmos philosophies have only been discussing about language or politics, writing or logic'. That 'oblivion' of Nature is therefore not a recent phenomenon. Philosophy, since its inception by the Greeks, has always been concerned with Nature, the latter being a permanent subject of science. The author of the Discourse on the Method, who was once accused of giving capitalism its political programme, is recognized as being responsible for the 'oblivion' in which Nature has been kept, since he designated it as a subject of 'mastery and possession'. The historic turning point is at the dawn of science and technology, when the Western Cartesian reason started to conquer the Universe.

To reply to our question 'What is Nature?' I shall resort to literature. I shall be inspired by a poem by L.S. Senghor 'Prayer to the Masks', extrated from Chants d'ombres, one of his six compilations of poetry. In 'Prayer to the Masks', the poet starts by paying tribute to the Masks. The first verses gradually take us from the physical to the spiritual world. The atmosphere which emanates from them is one of meditation and silence. We come out from the visible world, the world of space and of mortality to enter the world of the invisible, the world of the Spirit, that of eternity, the inner world, that of the Ancestors. The Masks of that sacred enclosure do not carry the signs of our temporality. As the poet says, they radiate an 'air of eternity', They are - the poet adds - devoid of any dimple and of any wrinkle. They are outside of time. Then comes the moment of the invocation:

'Masks with unmasked faces
Who made this portrait, this face of mine bent over the
altar of white paper
in your image, listen to me!

Africa of empires is here' dying
It is the agony of a pitiful princess.
So is Europe, to which we are linked by the navel.

Fix your eyes on your children who are being commanded,
Who give their lives like the poor man does his last dress'.

This poem written in 1945, fifty years ago, seems to describe with astonishing accuracy, the situation which we experience today: the agony of Africa, the salvation of which is viewed by a number of our contemporaries, as something of a miracle. From everywhere in this continent we perceive the cries of men and women, of children, of innocent people who are massacred, tortured, assassinated, A wind of hatred and violence blows from everywhere. Misery and poverty, aggravated by what is modestly called the economic crisis, are developing, and no one is able to foresee the end of it. But looking at it more closely, no single continent is saved, not even 'Europe to which we are linked by the navel'. The sight of our exclusions, of our fundamentalist ideologies from here and there, of our divisions is what we experience every day. They belong to this Apocalyptic Universe represented by Picasso in Guernica. Is it Africa which, in its 'agony', is leading Europe, that Europe which the author of '**Chants d'ombres**' called 'the defunct world of machines and canons' ? or is it the contrary? Would Africa and the West have a common destiny? 'We are linked by the navel', the poet sings. This means that we are in the same boat, doomed to perish together or to survive together. But let us not get it wrong. When the poet talks of 'Africa or Empires', he is talking about the entire earth, the Planet Earth.

In this poem, Europe symbolizes the West and the peoples who claim to belong to it: Africa, the other continents which seem to share a common destiny. This includes, as he reveals in another one of his poems, all the peoples from Asia, all the peoples from Africa and all the peoples from America who sweat blood and sufferings!

Nature is therefore considered here in its globality. One should go a step further, beyond the specific, the local, the homeland or the territory to feel the presence of the whole. It is Nature as a whole which is taken into "account by the poet, the global world which encompass all men, the entire mankind. It is Nature which has existed before us and which does not need us to exist. It is this Nature which, as it seems since Descartes, we have brought into our ownership, we have made a subject of exploitation, of 'mastery and exploitation'.

We now know that as a result of human interventions, the Earth, our Planet Earth is presently in danger and that this in turn threatens us. We are in danger. We are fully informed of these dangers that threaten us, ourselves as well as future generations, if nothing is done. The Scientists and Ideologists of our time have sufficiently warned us. The questions which they raise are no science fiction. They are, unfortunately - to speak like Claude Allegre - rough scientific realities. We measure to what extent man is a victim of his own 'lack of moderation', of his 'ubris', i.e. of his capacity to sow disorder.

If we want to go further in the analysis of the concept of nature, we should consider nature as history, culture, reason. We therefore perceive nature in its two dimensions, objective, as all-embracing and spatial, subjective, as culture and reason. Senghor's poem presents well these two dimensions of nature. Masks are works of art, artistic creations. The function of the Mask is to make pass away from the visible universe of the living to the invisible universe of the Ancestors, not of the dead, since in the culture of the people of Africa, as the poet Birago Diop sings, 'the dead are not dead'. One may doubt about it, as

this character for the Interpreters by Wole Soyinka. If the dead, he asks, are not strong enough to constantly be within us, should they not remain what they are - dead? How can we not see - and this is the reply that the author of *The Interpreters* puts in the mouth of the character, that such distinctions destroy what he calls 'the dome of continuity which is **life** itself, otherwise referred to as Force. Emanating from God, according to the Anthropologists, it animates, in the etymological sense of the term, all sensitive appearances of the world, of the cosmos, to accomplish itself in God. In this system, man becomes the active centre of the cosmos, and for man, **to live consists in harnessing all forces**. Senghor will say that 'it is by animating the visible and invisible world through art, by singing it and giving rhythm to it that man re-enforces the force of God, and by so doing, becomes like God'. **The cult of the mask, which is also the cult of the Ancestors, teaches us the meaning of life or the respect for life, for any life.**

What should we conclude from this first analysis? It results from it that what makes the force of man, his power, his greatness, is not conquering the world, dominating it, mastering it. The greatness of man seems to reside in **creating**, not exploiting the world. Thus, in view of their many interrelations, of their reciprocal intimacy, one is led to recognize the **unity** of man and world. In the work of art, it is precisely this unity as achieved which is admirably well reflected by Birago Diop in his poem 'Souffle'.

'Listen more often
to things and beings
the voices of fire can be heard
Hear the voice of water
Listen in the wind
To the sobbing bush
It is the breath of the Ancestors'.

What does therefore the return to nature mean in this context? According to Senghor and Césaire, it means taking root in history, in culture, in what we are, deep in our being, open to the values of the cosmos. When reading **Cahiers d'un retour au pays natal** by Aimé Césaire or **The Interpreters** by Wole Soyinka, one cannot misunderstand the meaning of this word. Neither for one, nor for the other this is an imaginary, fictitious, romantic and nostalgic return. It is an **encounter with the real country where we were born**. Entrenchment and freedom or a liberating awareness, that is the meaning of the return to nature. It does not mean a return to the pre-European era. Césaire strongly objects to this meaning. The meaning that we give here to this expression seems to be in conformity with his thinking. In the history of African literature, this trend of thought which considers the return to nature, identified with history, tradition, culture, as one of its major themes, has been called Negritude. It should be recognized that Negritude, because it is meant to be culture, in the sense of uprooting or surpassing of oneself, perfectibility, as such is not instinct. Its major ideologists have meant to promote a new society into which the most outstanding values of Africa and of the Western" world come to be melted. In this universal

harmony which they have strongly called for, a result of cultural interbreeding, they have believed in the rebirth of Africa, engaged in the path of development and progress, in concord and peace between men. How is Negritude related to peace? Let us go back to Senghor's work.

II

In one of his poems 'Prayer for peace', after imploring God's blessing on all the peoples on the earth, Senghor concludes with an evocation of peace.

'Oh, bless this people who breaks his bond
And with him, all the peoples of Europe
All the peoples of Asia, all the peoples of Africa and all the peoples of America
Who sweat blood and sufferings. And amid these millions of waves, see the turbulent
heads of 'my people
And allow their hot hands
to enlase the earth with a belt of fraternal hands
Under the rainbow of your peace'.

This relation to peace does not seem to have been sufficiently explained. This is one of the strongest intuitions of the founding fathers of this trend of thought. They thought that civilization and culture needed peace as a guarantee for their new progress. There is no culture, no civilization, no progress of mankind in the absence of peace. This has nothing to do with technological progress, but it well concerns the moral or ethical progress of mankind. Let us recall, following Kant, that peace is a requirement of reason and of law. It is a moral duty. Peace is not defined as the absence of war. One can be in a state of war even though there is no hostility. Peace means the end of all hostilities and not only the cessation of hostilities.

It supposes the rule of law, the replacement of power relations which characterize the state of nature with legal relations, based on the respect of peoples and of cultures. One therefore better understands that Senghor, in his revolt, does not forget forgiveness. In his poem 'Neige sur Paris', he mentions with virulence:

'The white hands which shot the guns that brought down empires . . .
the sour hands which gave me away to solitude, to hatred
the white hands which fell down
the forest of trees which overlooked Africa
at the centre of Africa...
They fell down the forests of Africa
to safeguard Civilization,
because human raw material was lacking'.

But he adds, thereafter, a few verses further:

‘Lord, I shall not take out my reserve of hatred’.

Cesaire also establishes a relationship between civilization and peace. His method however differs from Senghor’s, because of the importance he gives to punishment, to the re-establishment of the rule of law, without referring to any transcendence. And yet the warning is clear. ‘No one colonizes innocently, and no one colonizes with impunity; a nation which colonizes, a civilization which justifies colonization - therefore force - is already a sick civilization, a morally sick civilization which, irresistibly, and consequently, from denial to denial, calls for its Hitler, I mean its punishment. Colonization: starting point in a civilization of barbarity which can give rise, at any time, to the sheer negation of civilization’.

What should therefore be done to avoid punishment which can only come from a dialectical shifting of the power relations, recalling Rousseau’s writing in the Social Contract: ‘The strongest is never strong enough to always remain the strongest’? Let us once again listen to Cesaire who tells us the conditions: ‘If Western Europe does not, by itself, take in Africa, in Oceania, in Madagascar, i.e. at the gate of South Africa, in the West Indies, i.e. at the gates of America, the initiative of a policy on nationalities, the initiative of a new policy based on the respect of peoples and cultures; I mean, if Europe does not revigorate agonizing cultures or does not rouse new cultures, if it does not wake up fatherlands and civilizations... Europe would have deprived itself of its last chance, and with its own hands, would have pulled over itself the sheet of mortal darkness’. What Cesaire proposes is a genuine culture of peace, a complete change of mentalities, a radical and qualitative change in the way the West looks at the others.

It is not certain that Negritude was simply a Defence and illustration of the values of black civilization; it seems to me there is more to it: the conviction that civilization and culture require peace as a guarantee for further progress. In the absence of this guarantee, it is the state of nature, in which inevitably reigns the power of the strongest, a state of war even when there is no declared war.

A reflection on nature has thus led us to the relationship between culture and peace. But that was after coming across on our way with the question of our identity, which itself cannot be separated from culture. Nature first of all means human nature. Descartes had the same experience. When he started to search for the conditions of mathematical physics, capable of giving us knowledge which would be both certain and indubitable, he had two paths to choose from: that of science, ‘to establish something firm and constant in the sciences’, and that of culture; ‘it has been some time since I noticed that, from my early years, I had received a number of false opinions, taking them as true, and that, what I had ever since based on ill-assured principles could only be doubtful and uncertain; so that I had to seriously undertake once in my life to get rid of all the opinions which I had so far received in my creed, and start anew from the foundations’.

It is the scientific path which Descartes follows and which leads him to his first certainty or evidence, that of our identity as thinking subject, pure reason. Before discovering the foundations of science, he had to put in brackets all the opinions he had received. What Descartes calls 'opinions', is what we call culture. Descartes will later say that all the dignity of man resides in thinking. Man ceases to be in the centre of the world, in the centre of the cosmos. There is no longer any cosmos. What exists is a subject facing the world, The world is outside man and outside God, It is thus possible to affirm the ideal of a mathematical and 'objective' description or explanation of nature which has become for us, through the development of science and technology, a subject of 'mastery and possession'.

Senghor is convinced that we must 'change direction and leave the orientation imposed by Descartes philosophy - Cesaire joins him when, in his revolt, he condemns the Western reason: 'Reason, he writes, I crown you as evening wind'. What do they reproach modern rationalism with? With being without a soul. They reproach Cartesian reason with giving Europe the tools which allowed it to extend its power and to wage colonial wars abroad. Cesaire will identify that Europe, recalling that:

'The major historic drama of Africa has been, not so much its too late contact with the rest of the world as the manner in which this contact was effected; it was when Europe fell into the hands of the most unscrupulous financiers and industrialists that Europe 'extended' and as a result of our bad luck, it was that Europe that we met on our way..'

We should recall here, to pay him tribute, the merits of Kant, whose booklet entitled 'For Universal Peace', published in 1795 is also celebrated, alongside the fiftieth anniversary of the United Nations Organization. This booklet was reportedly known by President Wilson, one of the artisans of the League of Nations, whose interrupted work was resumed by the UNO. Kant is one of the thinkers of his time who took into consideration the phenomenon of colonization and who pointed out the link between peace and colonization. He can be reproached with not being in line with historic reality. However he provides us in his booklet with comments on that issue, which are proof of his clear-sightedness. Analyzing the inhospitable behaviour of the civilized States of Europe, most of them traders, Kant notes that 'the injustice which they display when they visit foreign countries or nations (visits which, for them mean conquering these countries) reaches frightful proportions. America, the Negro countries, the spice Islands, Capetown; etc... were for them, when they were discovered, countries which belonged to no one, since they did not take their inhabitants into consideration. In the West Indies . . . pretending that they only intended to establish trading posts, they introduced foreign war-loving tribes, and together with these, they fomented was between the various peoples of these countries, famine, trouble, perfidy and all the many evils which mankind is plagued with...'. A believer in free trade, he thought that a gentle form of colonization was possible, which would consist in establishing posts whose essential activity would only be the peaceful acquisition of goods. History proves that

things went quite differently. We should note on discredit the fact that he clearly stated the idea of a global solidarity of mankind **in the legal sphere**: ‘Solidarity, he said, which prevails nearly everywhere between the peoples of the earth has reached such a point that a violation of the Law in one single place is felt everywhere else’.

This is to recognize that the Law is universal and that gradually, in spite of delays and stoppings, mankind continues its irreversible march forward, towards the destination that Nature has determined for it. Nature wants peace. It definitely wants the Law to prevail.

But let us come back to our problem. If, as Cesaire says, the Europe of the ‘Industrialists’ deserves to be accused ‘before the human community from the highest heap of corpses in history’, is it more reassuring to want to achieve development and progress in Africa by resorting to African traditions? Is there not a risk that the return to our traditions play another role, especially at a time when nearly everywhere in Africa, we still find antidemocratic political powers, that care little about human rights, and that consolidate their positions’? The orientation taken by all these regimes gives priority to personal power, supposedly more in conformity with the African tradition, culture, personality y. In such a context, one can imagine, recourse to ancestral traditions, to custom, to cultural identity aims at adding legitimacy to the legal foundation of the political power. But it could also well serve to conceal the reality of power which, under the pretext of tradition, undertakes to violate human rights with impunity and arrogance. Examples of this are legion. Wole Soyinka’s word: ‘A tiger does not yell its tigritude; it leaps on its prey and eats it’, in other words, it lives its tigritude without going into conflicts of interpretation or discussion of authors, taken in sense which is perhaps not that which was meant by the Nobel Prize Winner, is a good illustration of the danger of a pronounced cult of traditions and of cultural identity, when they are adopted without prior criticism. In order not to live Negritude like the tiger lives its tigritude, one should not lack culture, one needs to establish a critical relation with our traditions, our mentalities, our creeds.

Cesaire ‘systematically makes an apology of our black civilizations’ - ‘they were courteous civilizations’, he said.

‘They were communal societies, never of all for just a few
They were not only pre-capitalistic societies, as they say, but also
anticapitalistic societies
They were democratic societies, always
They were cooperative societies, fraternal societies . . .
They were, despite their defects, neither detestable, nor condemnable,
The y simply existed. For them, neither the word ‘avatar’, nor the word
‘failure’ had a meaning.
They preserved hope intact’.

However he does not recommend that we should resurrect these societies which he publicly praises. An attempt to reduplicate them would be, as he says, a utopian and sterile view. One should live with one's time, go further ahead to build a new society. In considering ancient societies, what Cesaire sees is their dynamism, their capacity to create values, to manage conflicts and contradictions. These societies were destroyed by imperialism. Since their evolution was stopped, they are viewed by us as perverted societies. They contain, like other cultures, their zones of barbarity. They exude both intolerance and attitudes of exclusion. They continue to be used as an alibi for dictators who, under the pretext of our traditions and national identity, pretend to live their negritude with authenticity, while violating human rights, sowing hatred and terror.

We should remember that for the fathers of democracy, personal power is the melting pot of the arbitrary and of injustice. This Locke's idea. The same is found in Spinoza who sees in personal power the symptom that the political body is sick. It reveals that State organs and institutions do not work properly. This type of government appears where control institutions are lacking, where confusion of powers is the rule, where the freedom to think and to write does not exist. One can efficiently fight against the abuses of personal political power, always dominated by the passion of ambition, only if one has, opposing it, an informed public opinion, which is aware and free to think and to express through words and writing what it thinks. One therefore understands that Spinoza considers the fight against personal power as the essential problem in the functioning of the State and in political life. As a source of arbitrary and injustice; it is, still today, the fundamental problem of Africa, since it is democracy which is at stake. Filled with democratic culture and with modern culture, Africa can be assured to experience more stability and hence, to live in peace.

THREATS AND HOPES

by Ubiratan D 'Ambrosio

WHAT BRINGS US TOGETHER?

“We are here to counsel with each other. We must build spiritual and scientific bridges linking the nations of the world”,

(Albert Einstein, 1947)

It is rewarding to have the opportunity to renew our thoughts on a transdisciplinary approach to the understanding of ourselves and of our place in the cosmos.

It is good to be again together since this gives us the opportunity of deeper reflexions. It is also important to recognize the need of more intellectual support which results from such encounters. In a moment of so strong and widespread indicators of nationalisms, fundamentalisms and 'back to basics' in human relations ('basics' meaning an eye for an eye!), a planetary view is needed. Even in my home country, Brazil, built my strangers who arrived, voluntarily y or forcefully, since the 16th century to dominate and to impose to the natives alien modes of explanation, of understanding and of copying with reality, there is a growing trend towards being tougher with 'deviants'. Claims for. the elimination of them, even through the establishment of death penalty, are widespreading all over the world.

But we see not much enthusiasm for love. Again using Brazil as an example, when we are in the peak of our most important festival, the Carnival, some people criticize the parades as shown in television, They say they are immoral - clothing is summary - hence this should be forbidden! But in the same week of Carnival we see scenes not of parades and of happy people dancing and loving each other, but of atrocities. A few years ago we were able to witness the joy of soldiers in the Gulf War after the successful bombing of civilian targets - with the explanation that there might be there a strategic target - and today we hear rationales of both opposing parties of former Yugoslavia to justify their atrocities. But no one would claim these scenes are immoral.

My views are confirmed by the interviews and scenes with pilots returning from these actions. The pilots were happy because they were able to look at the targets, to launch the missiles and to see that everything material was destroyed. Even appealing to the

unsustainable principle of the *bellus justum*, to see these happy, smiling pilots feting the result of their mission of death and destruction is perturbing. Interviews and scenes of happy and loving people, masked as buffons, are banished, while the pilots, in death dresses, are lauded and feted as heroes. Everybody remembers these scenes. Anything alive would be destroyed, but the cause justifies. A bomb destroying buildings and preserving life - as if possible ! - did not go further than a project, while weapons liquidating people while preserving buildings are intensely produced. A life is worthed less than a building. We have seen in television big smiles of joy when the targets were hit. These faces are obscene! A military parade, showing canons and bombs, is applauded, a parade showing a few beautiful naked bodies is banished on grounds of immorality!

I have to confess sometimes I feel embarrassed watching these naked bodies in TV in the presence of my three years old grand-daughter! And many people feel the same. But most will agree that this embarrassment is so mild when compared with the repulsion and shame of seeing a pilot aiming at a house, pushing a button and assessing the total succes of his act: destruction and death! I cannot show my face to my grand-daughter when such a scene is shown. And yet some people have the cynical attitude of proposing a censorship for television! How can one talk about a decent behavior as a result of censorship. This is the height of immorality.

No one complained and does not complain about showing the kind of immorality I mentioned above - and indeed I feel it is important to show these pictures about bombings, concentration camps, prison massacres, and other demonstrations of the insane behavior of *homo sapiens sapiens*. So people will not be fooled with talks that 'Peace has arrived' or maniqueistic discourses such as 'The fall of the Berlin Wall meant the redemption of mankind'.

There is much more to be said. But all these issues can be synthesized in one phrase: respect and love for life !

HOW DID WE REACH THIS POINT?

'The dead and the non-dead are the two great divisions of primitive society which seem almost to stand to each other in the relation of exploited to exploiting classes. . . . The immortality of the dead is a fantastic reality'.

(Christopher Caudwell, 1908-37)

It is interesting at this moment to venture into some etymological remarks. In the main Indo-European languages, the word life comes from two roots. One, traced back to the Latin (*vie, vita, viola*) has a meaning of behavior, which in the 11th century has been

identified with the of a complex system in evolution from two status, birth and death. In another conception, life comes from *leip* which has to do with the functioning of the body (liver, lipo). In both there is the sense of a dynamics of continuity of the individual and of the species, of survival. The search for nourishment and mechanisms of reproduction are imprinted in the genetic code.

Modern science and technology have created just about everything, except life with the splendourous complexity of continuity and reproduction. Continuity not only of the individual, but of life in the most general sense. Out of these drives, intrinsic to life, we see the rise of altruistic and ecological behavior, which are the warranty of life. Like every living being, *homo sapiens sapiens* is driven toward survival of the individual and of the species which permeates our entire existence, in the span between birth and death. But unique among all the species, we are provided also with a sense of time, we aim at transcending our existence, going before birth and after death, driven by consciousness and will. Understanding consciousness and will are present in the earliest manifestations of human behavior. Looking for our past and for our future have led to cults and spirituality, in the forms of traditions and religions, and to divinations, in the form of arts and sciences. Knowledge means the acquired ability of surviving and transcending.

Under this dual drive towards survival and transcendence, human behavior has marked an evolution towards the acquisition of knowledge. In this evolution some distortions are noticeable.

The main particularity in this evolution is a contradiction with the commitment of preservation of life in the essence of its code: continuity of life through the survival of the individual and of the species. Although it is intrinsic to life the elimination of one individual or of species so that other can survive, under altruistic and ecological behavior, in the human species this is done under the motivation of consciousness and will. The basic question we rise is related to this, that is, the elimination of one life so that another go on. This is the most fundamental issue of individual, social and environmental morality.. In this multiplicity y we place ethics.

WHAT DOES ETHICS MEAN?

‘The knowledge of good and evil seems to be the aim of all ethical reflection. ... In the knowledge of good and evil man does not understand himself in the reality of the destiny appointed in his origin, but rather in his own possibilities, his possibility of being good or evil’,

(Dietrich Bonhoeffer, 1906-45)

What does it mean an ethical behavior? Again, an etymological exercise show us that ethics, as well as ethos and ethno, refer to the other. It is the recognition of the other which brings the need of an ethics. The recognition of conflicting behavior of the other in oneself, the other in the strange, the other in competing societies and species. To prevail upon the other concur with the drives towards survival and transcendence. The equilibrium in this concurrence is the major and essential issue. My reflections are permeated by this single question.

It has been frequent in the behavior of our species the acceptance that some forms of life are more worthed than others and some are not only useless but in some cases threatening. Some species are dangerous - so away with them! In the same vein, some individuals in a certain species are less productive, give us less of aimed benefits, so away with them ! Some indeed bother us, like a mosquito in the middle of the night. So, away with them ! And this cascading reasoning can be carried on to our own species: some are less productive, so away with them, some bother us, so away with them. If we use insecticides for mosquitoes that bother us, why not to use guillotines, electric chairs, and nowadays letal injections to eliminate those deviants that bother us.

Summing up, human behavior has been increasingly dominated by the feeling that one individual may be worth more than others. This is the origin of modern social and environmental behavior. I see no way of facing man's social and environmental behavior other than looking into values and generating an appropriate ethics, focused on reestablishing concurrence in equilibrium with survival and transcendence.

Scientific knowledge has grown and continues to grow, apparently without limit to its reach, disclosing the mechanics of the universe and giving us the capability of looking into the minute and most elementary components of matter, of touching and shaping the evolution of living forms. This same mode of thought, scientific knowledge, has been used to convince individuals that they are close to absolute truth and boast such a degree of precision and self-confidence that the humbleness of search is replaced by the arrogance of sureness, which intimidates inquiry and praises dogmatism.

Most of the distortions in the long search of mankind for knowledge throughout history has been the result of a segregationistic separation between science and traditions. Something like a *neurosis philosophicus* tries to identify and to emphasize contradictions between traditional knowledge and scientific knowledge. The attribute of 'rational' is reserved to the later in a detrimental and contemptuously way for the former. Ethical responsibility has been 'rationalized', brought into normative codes, or reserved; in depreciation, to the domain of values and traditions. The renaissance consolidated modes of thought which has originated in the civilizations of the antiquity around the Mediterranean. A new mode of thought was developed in Europe and imposed through the world after the navigations.

The western ‘civilizational mission’ which started about 500 years ago, resulted in a model of society dominated by science and technology and a consequent economical, social and political order. Modes of production and division of labor and new concepts of property and wealth, are intimately related with underlying philosophy which made all them possible, which was indeed proposed to justify the conquest-colonization process. In this process to justify the conquest-colonization process. In this process gods, languages, modes of thought, of labor, of property, of health and so on were imposed throughout the globe. Science and the values associated with scientific and rational thought were often used to relationalized variants of exploitation of human beings by human beings in the process of building up agricultural supplies, The concept of humanity and an ethics for the entire mankind was gradually removed from this thought.

This mode of thought, prevailing since the 16th century was responsible for 1. interpreting differences among human beings as different stages in the evolution of the species; 2. explaining unsatisfying basic material needs as ranging from lack of industry to laziness, and the search of the satisfaction of spiritual needs as lack of scientific rationality; 3. and the preservation of natural and cultural patrimony as obstacles to progress. Indeed, progress is a concept associated with the new thought.

All these three characteristics of modern thought lead to a despicable behavior. The associations are clear: 1. with arrogance, 2; with indifference and inhumanity, 3. with irresponsible behavior. These are capital signs and may cause the destruction of the species. They violate the natural wisdom of a species, they dictate the most serious threat to the extinction of *homo sapiens sapiens*.

The search for counteractions to 1. 2. and 3. synthesize the hopes for preservation of life and civilization on Earth. We risk to go away from the simple ideas underlying the complexity of the behavior of *homo sapiens sapiens*. We have to restore dialectical complementarity of theory and practice. But we are frequently trapped by the fascination of the theoretical discourse at the expenses of the recognition of the essence of the practice. Isn't this the essence of transdisciplinarity?

A NEW ETHICS

‘The greatest philosophical error is to count as philosophers only philosophers proper when every man of some greatness must have shaped their own philosophy; and the reason for their not technically uttering or specifying it in the technical language of knowledge philosophy may be their feeling that their philosophy was all the more philosophically true when it remained unstated’.

(Paul Valéry, 1871-1945)

The species can not survive without an ethics which counteract the characteristics of modern thought and appeal to the simple and primary principle of preservation of life and civilization on Earth. We call this the ethics of reservation:

1. respect for the other in spite of all the differences;
2. solidarity with others in the satisfaction of their basic needs for survival and for transcendence;
3. co-operation with the other in the preservation of the common natural and cultural patrimony.

Can civilization survive without such an ethics for the entire mankind'?

FUTURE CHANGE, CONSCIOUSNESS AND LEVELS OF REALITY

by Michel Random

A exactly 8.15 a.m. on 6 August 1945 a cataclysm of fire struck Hiroshima. Three days later, it was Nagasaki's turn. Nuclear explosion, humankind's greatest invention since the discovery of fire, entered history by killing 120,000 people.

The modern age thus revealed that its basic character is violence.

Violence with incalculable, terrifying consequences, of which Einstein and Oppenheimer became aware when the first bomb exploded. At Princeton in 1946 Einstein said: 'We must understand that we cannot work for war and peace at one and the same time. It is only when our hearts are resolved that we fill find the courage to overcome the fear haunting the world'. -

This fear, more present than ever, must more than ever become a fight for life too, for the modern world is one of accelerated, continuous change, change in exponential acceleration. It took 4,000 years to advance from the Iron Age to the Atomic Age, but in less than 25 years we have known the Cybernetic Age, the Space Age and the DNA Age, and we are now in the Cyberspace Age. Soon we will be in the Biotic Age and then probably in the Age of Antimatter. Each of these 'ages' represents a profound change in our societies, an upheaval that changes our reality, our lives and the scope of our imagination.

But as yet we perceive only dimly the fact that we have gone from the Age of Life to the Age of Survival. We all know about the pollution affecting earth, air and water, we know that our earth, Gaia, is sick and that we continue to feed her poison. We know that there are types of pollution that can be cleaned up and others that do lasting damage - such as nuclear pollution and that caused by carbon monoxide, the most frighteningly dangerous of all because it destroys the ozone layer. Gaia could become simply scorched earth, dead for millennia. This fact alone means that human and other forms of life could disappear from the planet in a relatively short time.

It is true that opinions on this differ. There are optimists and pessimists. There are also the facts: the increase in ultraviolet radiation is a reality; desertification is growing irredeemably; five million species have disappeared; and a good quarter of humankind is suffering from undernourishment and famine.

Can we continue to live with this sword of Damocles hanging over us and pretend it is not there? We must not, of course, turn fear of the present and of the future into a hue and cry, nor enumerate all the disasters of humankind to provoke some sort of philosophy of despair, but we should simply observe that regards to increasing of modern world it exists a possible negentropy which appears as a new consciousness.

It is in this strange context that we are fascinated by the new technologies nom of computers. They have become so refined and offer such incredible possibilities that they are spawning a sort of new science fiction romanticism: the appearance of a new human being, a new intelligence in which the human brain, increased tenfold by the almost infinite possibilities of microprocessors, sees no limits to its own. These human beings - whom Joël de Rosnay calls 'Symbiotic' - live in cyberspace, where the real and the virtual, the imaginary and the fictional, can be given form as images, graphics, mathematical models, virtual people in the form of holograms, etc.

These new human beings control all the energies of matter, manipulate particles one by one, create new molecules at will, cut, paste and recombine pieces of DNA, compose and change the living order at will. They have godlike power, with an intelligence comprehensible only to their peers and their own language and codes. In short, they now belong to the human race only in appearance: above all they are cyborgs, beings who have created themselves out of another race or species. 'Homo symbioticus' can do anything: restore the ozone layer, conquer every disease, resolve all pollution problems.

It is true that in 1989, when the symposium on the survival of the planet was held in Vancouver, 'Homo symbioticus' did not yet exist, otherwise the symposium would not have taken place. More seriously, I believe that many of us here asked questions that are still highly relevant. One of the aims of the meeting was to write a 'Declaration for Survival', but unfortunately it was not done,

Such a '**Declaration**' would require a considerable amount of work and scientific knowledge, but if it could be written and signed by a large number of scientists and moral leaders it would perhaps have the merit of raising awareness and bring about a greater sense of responsibility on the part of the leaders of the planet.

There are a few personal suggestions I should like to make:

1. The situation of planetary survival that faces us has its origin in a materialist conception of reality that is itself a phenomenon of entropy leading to the possible destruction of life on the planet,
2. Only a holistic conception of reality qualitatively bringing together the part and the whole expresses a vision that is in accordance with the meaning of nature and life. This conception is one of a negentropy and contains within it the creative, dynamic sources of life,

3. Reality as we perceive it is consciousness. Although reality presents itself to us like an expanding cosmic egg, it is the holographic image of our consciousness. There is, therefore, a relationship or total osmosis between consciousness of reality and our own consciousness. The two consciousnesses are therefore consubstantial,
4. Within this hologram our consciousness perceives and determines 'levels of realities' that topologically define part and whole, space-time, quantum uncertainty and the subquantal vision. The levels of reality take account of all the aspects of the complexity that is at once apparent and hidden and covers all the explicit and implicit aspects of our own thought,
5. A qualitative vision of reality links us to the essential laws of nature, just as the leaf is linked to the branch and the branch to the trunk. This vision in which each part is interdependent with the whole could create a totally new model of society that would make the survival of the planet possible.

These five suggestions presuppose a revolutionary change in concepts at every level, a progressive but rapid change in our actions in every field, and particularly in town-planning, social and economic life, the media and, above all, education.

What part could the new technologies nom of computers, such as the information super-highways, play in this mutation? The answer is another question: do the qualitative aspects of information depend on the medium or on the mind that is requesting it?

In fact, the people on this planet form a single species, and the preservation of the species leads to only one result: the preservation of life on the planet. Awareness of this means that every individual understands and respects life. If we succeed in re-establishing the balance in favour of life, the planet will survive; if the forces of entropy triumph, life will disappear.

Such a change no doubt seems utopian at present, but if there is a sufficiently large increase in energy awareness throughout the planet, quality may triumph.

When life is in danger nature sometimes acts unpredictably; new archetypes of collective values may appear and be rapidly accepted by all. When a genuine reflex of survival appears throughout the planet it is not impossible, although still unimaginable, that such a change may suddenly take place.

Many symbolic and real changes may prefigure this new consciousness: the advent of quantum physics, the recognition of traditions, levels of reality and transdisciplinary thought are all major, qualitative aspects prefiguring a new order of thinking.

This new order of thinking leads to respect for the specific characteristics of ethnic groups, to the emergence of a society of shared responsibility in which the survival of all depends on the qualities of each of its members.

How can the planet survive in a state of complete anarchy from which all ethical values have disappeared? How can it withstand miscalculations in the use of nuclear energy, genetic engineering and economics? We are witnessing the 'implosion' of all the quantitative aspects of our societies that are becoming unmanageable. The world cannot survive if disparities in living become too great. The increase in disparities is leading to unbearable social problems, to a situation in which the minority wields power over the poor, weak majority. This situation alone is creating such an entropy that all system will collapse.

These ideas require complex research that in time could be the subject of a large symposium which prompts me to say a few words about the importance of one or two symposia that have left their mark on thinking over the last half-century. These international meetings, apparently confidential, involving a small number of thinkers, in fact play a special role that can be appreciated only later. A small community of thinkers is in itself a dynamic entity within its very contradictions. Time shows that some symposia have made an important contribution to the evolution of thought and then become reference points.

For example, the Cordoba Symposium in 1979 began a debate between the human and natural sciences; the Tsukuba symposium in 1985 showed how little Westerners understood Eastern and Japanese thought, but a great deal of work was then done, and now the concepts of *Ki* and *Harmony* used by the Japanese are better understood in the West. In 1986 the Venice symposium, followed by the '*Venice Declaration*', brought out the parallel importance of both tradition and science. Furthermore, the now famous '*Venice Declaration*', conceived by Basarab Nicolescu, is still a reference for everything done in this field. The symposium was the starting-point for transdisciplinary thought and everything being done today. The Vancouver 'Symposium on Science and Culture for the 21st Century: an Agenda for Survival' in 1989 was a source of information and important questions linked to survival of the planet, and the questions raised then are more relevant than ever. The São Paulo Meeting on 'The Education of the Future', in 1993, brought out the importance of affectivity and the qualitative aspects of education. As for the present symposium, it will help create a new awareness of the future and establish the best ways of bringing it about.

'Our thoughts are acts', as Henry Stapp so rightly said; they express force fields and contribute to a general change in ideas - and ideas affect awareness of reality. The more our ideas are qualitative, the more reality becomes so. Perhaps 'reality' is using us, independent of our individual will, to express its own consciousness. Reality is certainly contradictory and paradoxical, dissymmetrical and creative; everything is 'void', according to the Tao, but we know that this void is pure energy and that energy is pure consciousness.

While the information super-highways provide a symbol of planetary unification in communications, this technological change also prefigures a new planetary consciousness. Whether we are from the East or the West, there is a consensus: We know that it is the qualities of our consciousness that determine reality. We know that Gaia, our 'Earth Mother' is in danger and that we must fight tooth and nail on all fronts to save her. The Manichaeic powers of death and destruction are perverse and unpredictable, but preserving life is also an irresistible act of planetary awareness.

One day soon East and West will share the same holistic culture, and heavy causality will be confined to the definition of weights and measures. East and West can communicate in the same quantum vision, in which the inseparability of part and whole will be the basis of a great change in planetary awareness. This is why transdisciplinary thought can play a decisive role in the appearance of this new thought and awareness. The age-old wisdom of tradition and quantum thought are globally holistic.

But Eastern thought is better able than Western to make holistic thought part of reality. The Tao is pure energy, and this pure energy becomes medical, natural and economic science, and its concrete applications are numerous. 'Chi' is the energy of the Tao. 'Chi' means the steam that rises from the cooking pot, an imponderable image of energy that hangs everywhere like a universal breath. It is a consciousness energy in harmony with human consciousness, and this imponderable energy is what is made of it, pure consciousness or sudden power.

The dynamics of contradictions is born of Yin and Yang, the subtle and the effective, actualization and potentialization, as Lupasco would say, and the 'T state'. Western pragmatism began with the search for the basic unit or 'building block' to explain reality; Eastern pragmatism is born of the principle of emptiness, that is the energies of the whole that are manifest in the part, and over the millennia the East has never changed direction - which is why the East is so far ahead of the West in pragmatism.

Now, however, Eastern subtlety and the Western vision of the qualitative can converge. Our void and the Tao share the same consciousness. Transdisciplinarity can be both Eastern and Western; Western scientists can easily practise Tai-chi and understand the energies of 'Chi' or 'Ki' for themselves.

Eastern thought is based on the science of subtle energies and the concept of harmony. Cosmic energies and consciousness energies are a single 'body-mind'. Harmony resonates at all levels of beings and things, it is the creative breath itself.

The West discovered systemic thought, quantum inseparability y. Holographic vision, transdisciplinary thought and the levels of realities are all holistic concepts that are also manifestations of subtle thought.

Hence the great change of the future - that the East is in the West and the West in the East - has already come about. By sharing the same holistic vision of reality we will find a common language. This is the true basis for unification of planetary thought. East and West have the same wealth of intelligence, but each must learn from the other and enrich itself by questioning the other.

Subtle thought is more pragmatic than causal thought. Subtle thought includes all levels or realities in action. This is why the East, which acts on the long term, includes in its vision energies that are outside the scope of causal, linear thinking. It is also for this reason that the economic tide is turning from the West to the East. Materialist thought is

sudden and acts on the short term but lacks realism, while Eastern thought implies a prior vision of action. The West destroys the results of its own actions, while the East conducts a strategy in which action is the result only of a long maturing process. This is why materialism is an utopia that creates entropy, while holistic thinking is a negentropy that harmonizes with the nature of life.

The West confuses the 'tools' of knowledge with knowledge itself. The East knows that knowledge is nowhere and everywhere, that the success of an action depends on the quality of consciousness that one puts into it.

The Western vision is relatively simlistic; at the economic level it is entirely directed towards the conquest of markets, while markets proceed from the conquest of ideas. It is true that the planet as a whole needs more wealth, but this wealth proceeds not from a uniform, standardized vision of consumption but from development that takes account of the specific local realities of each country. The single world market is a Manichaeian, reductive concept which argues that the development of wealth produces consumption and consumption produces wealth and therefore new markets. This vision comes up against specific local conditions and traditional cultures and brings about the rejection of Western technology, which is perceived as a force for constraint and dissolution.

If the Western model is not replaced by a global, holistic concept it will in the end lead to the destruction of the planet. In particular it is producing all the fundamentalist movements that demonize the West as the source of all evil. The East avoids deionizing the West, but its strategy is to gradually gain control of the means of production and eventually reduce the West to a vast consumer market.

These economic struggles in fact reflect a clash of consciousnesses and cultures, but the survival of the planet must take precedence over economics. In this, imagination, information, training and new consciousness can go hand-in-hand, and the super-highways of the new technologies can play an important role. Eastern and Western transdisciplinarity can enrich each other, create new universities, establish common programmes; the science of life must be distinguished from manipulations of life; a planetary ethic associated with planetary survival must be nom and spread. Molecular biology and systemic thought show that large groups are built upon the differentiation and specificity of small groups. Similarly, large international organizations have a limited role and will survive only if they model themselves on autonomous networks of small units growing out of local synergy, even if they are inspired by a global vision.

East and West can use all the modern technologies for reciprocal teaching: understanding in particular the cultural wealth of traditions is fundamental for a West that has lost touch with its own origins. There too transdisciplinarity can play an important part. Although the whole planet is 'surfing' over the increasing complexity of modern times, the qualitative sources remain stable, ensuring the surviwl of the basic spirital values that alone give meaning to life and contribute to respect for nature. World pollution is a reelection of the pollution of minds, and it can never be said often enough that this extraordinary psychological and spirital pollution is the product of materialism, dualism and the separation of mind and body.

The Western scientific world is still paralyzed by the cultural stiffness of the past, of linear, causal thinking. But these modes of thought are changing rapidly with the new generations, and it is on those generations that training and education should therefore be concentrated. The holistic vision of reality is infinitely rich; it changes all economic, social and political structures and introduces flexibility, rapidity and reliability into minds and institutions; above all, it generates greater speed, efficiency and an enormous economy of costs and investment. The East has a great deal to reach us about transdisciplinarity,

The development of the new technologies cannot be stopped, whether they are for better or for worse. The worst, for example, consists in saturating minds with masses of images and information that produce nothing but new forms of mental alienation; there are already Internet addicts who spend 10 or 15 hours a day in front of their screens. But in time all hunger dies down. What is important is not to leave new technologies only to the merchants of the temple but to use them to send out information and teaching of quality, giving people greater awareness and inner wealth.

It is true that the new technologies and information super-highways could, like television, become formidable instruments of power in the service of a new 'Big Brother'. The almost absolute control of billions of people is no longer science fiction. Immense banks of data on consumers already exist, and it is possible to identify which consumer out of several million may buy a particular product. But even if such a thing happened, if the Machiavellian intelligence of a Big Brother managed to tame the planet, the hydra would rapidly be checked.

The new technologies do not impose any ethic, any more than genetic engineering, nuclear energy or all the other novelties of the future. But a world without an ethic will become uncontrollable and destroy itself. However that may be, the future is no longer a cul-de-sac but an enormous changing planetary consciousness. It is true that huge social cleavages are appearing between the users of cyberspace and the millions left by the wayside, whether they live in poor countries or are unemployed or marginalized in the rich countries, but in the end a civilization cannot allow generations of 'sub-humans' to form, at the risk of being destroyed by them.

Conclusion

The clear message of future change is one of revolution and unprecedented planetary unification. How are the unity of reality and complexity to be brought together? How can we be pragmatic and visionary? How can we respect life, safeguard life on the planet and resist all the forces of destabilization? How, in a word, are the needs of this world and of the spirit to be reconciled?

When we look at the world as it is today, we have cause to be pessimistic. But the world is not composed of merchants and a cynical, unscrupulous Mafia: there are many 'Don Quixotes' who believe in the values of the spirit and in respect for others. It is the invisible development.

The near and more distant future will be made of constant upheavals; humankind will be severely tested; individuals will be faced with constant change in their lives. There will still be barbarity, but overall change will gradually become qualitative and exponential. Women are being called upon to play an ever greater role, since they are naturally the carriers of fertility and the guardians of life.

Gradually the holistic vision will show that knowledge and consciousness are one through space and time. Levels of reality will be better understood; conceptual and cultural differences will complement instead of opposing each other. There will still be contradictions and even conflicts in societies, but the preservation of life on the planet will come to the fore, and consciousness of survival will lead new generations to change profoundly the way the planet works. It will be the real New Age. Is this utopia or reality? In fact, this change is already underway, and in this vast programme of present and future, in this vision of a new, fertile cultural and spiritual transdisciplinarity, we must begin with the most urgent change of all: the changing of ourselves.

EQUALITY, DEVELOPMENT AND THE PURSUIT OF PEACE

By Mrs Mely G. Tan

Introduction

The title of this paper, albeit with some modification, will easily be recognized as the theme of the United Nations World Conference on Women, that at the time of this UNESCO Symposium is still taking place in Beijing. There are two reasons for selecting this topic. The first is the realization that this conference is conducted for the fourth time, indicating the continuing importance of and support for this kind of gathering on women's issues on a global scale. One indication of the importance of these mega conferences, as a manifestation of the women's movement, is the open letter of Pope John Paul II addressed to all women in the world, written in anticipation of the Beijing Conference, in which he recognizes that in the course of history, including the history of the Catholic church, women have suffered inequalities, injustices and oppression. He clearly pays tribute to the women's movement, when he states that '... I cannot fail to express my admiration for those women of good will who have devoted their lives to defending the dignity of womanhood by fighting for their basic social, economic and political rights, demonstrating courageous initiative at a time when this was considered extremely inappropriate, the sign of a lack of femininity, a manifestation of exhibitionism, and even a sin !' (1).

The second reason has to do with the fact that in reading the reports of the three previous UNESCO meetings on the theme of Science and Culture, only the report of the third meeting in Belem in 1992 mentions women and rather prominently in a separate paragraph. The report of the first meeting in Venice in 1986 and the second in Vancouver 1989 have only some passing reference to women in some of the contributions. Moreover, I could identify only one woman's name as a participant in the first meeting and one also in the second meeting, while, in the third meeting, fortunately, I identified four women participants(2).

Based on these observations, I decided that it would be appropriate in a series of meetings with the theme of Science and Culture, to discuss the phenomenal global movement of women that has continued unabated and with increasing vigour, for the last 20 years. After all, in most countries women form at least half the population and in virtually all societies they are the preservers and continuators of the social and cultural values, the backbone of social life, the society adheres to. However, at the same time, while a numerical majority, they often have the status of and are treated as a minority group: they

are excluded from many of the important positions and activities, and therefore from the process of decision-making, in society and they are treated as second class citizens in the political arena and in the workplace. To illustrate, a disturbing development is occurring recently in countries where women's representation in parliament has been high relative to most western countries: from 1987 to 1990 there has been a dramatic drop in the proportion of women parliamentarians in Eastern Europe and the USSR. For example, in Bulgaria it dropped from 21% in 1987 to 9%, in 1990, while the corresponding figures for Czechoslovakia were from 30% to 6% for Hungary from 21% to 7%, for Romania from 34% to 4% (The World's Women 1970-1990, 1991). Indications are that this situation is continuing until today.

Many theories, in particular psychological (Freudian) and sociological (Marxian and Parsonian), have been posed explaining the inferior position and the asymmetrical relationship of women vis-à-vis men throughout the history of humankind, most prominent being the nature versus nurture theories. It is not my intention to go into an expose of these" theories as they are well-known and in fact in some societies the debate and the controversy still continues.

Whatever the theoretical explanations, these conditions that are perceived as unjust and in many instances inhumane, violating the dignity of the female human being, have generated the present women's movement, that had its beginnings in industrial countries, notably the United States and Western Europe. As usually happens with social movements, at the outset, the activities of their proponents were often outrageous and by many, both men and women, considered unacceptable, as they are contrary to the prevailing norms of thought and behavior appropriate for women at the time(3).

Since the 1960's, with Betty Friedan's now classic The Feminine Mystique, and especially since the 1970's, there has been a virtual avalanche of literature and other media products, exposing all aspects of women's condition. Their plight, but also their achievements, have been graphically described in statistics, scholarly books and papers, political tracts, media reports, novels and poetry. More recently, special attention has been paid to the women among the poor. As Noeleen Heyzer, the director of the United Nations Development Fund for Women (UNIFEM) observes: 'The feminization of poverty is a global phenomenon. The number of rural women living in poverty has doubled in the last 20 years. Today, women constitute at least 60 percent of the world's one billion poor. What lies behind these statistics - and others that point to the worsening economic situation in which so many women and their families are living- are the everyday challenges that millions of women encounter in their struggle to survive'(5).

No doubt, it is the power of the media that has contributed to the increase in size and strength of the movement and to its spread all over the world. These developments culminated in the proclamation by the United Nations Organization, of 1975 as ' Women's International Year' and the decision to have a UN World Conference on Women, to be held, of all places, in Mexico City, Mexico in July 1975. The irony of this was not lost on the media and the report of the event was titled in Newsweek magazine of 7 July 1975 'Lib in Macho Land'.

Probably one of the most interesting outcome of the event was the realization that the women's movement was (and is) by no means homogeneous. As a matter of fact, the global divide between North and South was clearly apparent. The equal emphasis given on equality and development generated a heated debate, with many delegations of developing countries contending that the concern should be on development, while many of the delegations of developed countries expressed concern that this emphasis on development would jeopardize the struggle for equality between men and women that they consider the most fundamental theme of the Conference (Ester Boserup, 1975)(6).

Nonetheless, the theme has been consistently used from one conference to the next, although at the Beijing conference the theme has become 'Action for Equality, Development and Peace'. We may recall that after the Mexico City Conference in 1975 that produced a declaration and platform of action with the theme 'Equality, Development and Peace', the second Conference was held in Copenhagen in 1980 (with the objective of a mid-decade review), the third in Nairobi in 1985 (producing the 'Nairobi Forward-Looking Strategies'), while the fourth is, at the moment, still going on in Beijing (4-15 September 1995, while the NGO Forum was held from 30 August to 8 September 1995).

All through the three conferences (and also indicated in the fourth), the emphasis has been on equality and development, more than on peace. It would appear that the two first concepts are considered prerequisites for the attainment of peace, or conversely, peace is the outcome of equality between men and women, and the implementation of sustainable and people-oriented development. Hence, both the declaration and the platform of action of the four conferences, give more space to the objectives and actions to achieve equality and development. However, from one conference to another there is an increasing convergence discernible between the developing and developed countries on these two areas of concern.

In this paper I will discuss all three concepts, but with special attention to the concept of peace, in the context of one of the sub-themes of this symposium 'Culture of Peace'. As the documents of the Beijing Conference I have in hand are still in draft form, I will use for reference mainly the document of the Economic and Social Council on Asia and the Pacific (ESCAP) regional conference on women and development, held in Jakarta in June 1994 (although at some points still referring to the Beijing draft documents). This document is titled Jakarta Declaration for the Advancement of Women in Asia and the Pacific (henceforth referred to as the Jakarta Declaration)(7).

The participants at this conference were the relevant ministers, senior officials, experts and NGO groups from countries stretching from Iran to the South Pacific Islands (including China, India and Indonesia, three of the most numerous nations in the world). The organization of this document follows that of the Beijing conference closely and, with the results of the other regional conferences, were used as input for the UN secretariat to draft the Beijing documents. By looking at the ESCAP document we get an idea of the thoughts, concerns and aspirations of the women who form the largest, and today the most dynamic, geographical grouping in the world.

In the Jakarta Declaration there is only one point referring to peace: 'The role of women in peace building and conflict resolution should be enhanced and strengthened' (point 9). The Draft Declaration of Beijing has a proposal submitted by the 'Group of 77' (comprising 134 developing countries), which is also included in those submitted by the US and Canada, which is worded much more strongly: 'that national, regional and global peace is attainable and women are a fundamental force in leadership and for the promotion of lasting peace'.

In the Plan of Action of the Jakarta Declaration, there is one section in chapter III, referring to 'Inadequate recognition of women's role in peace-building', and in chapter IV, referring to 'Enhancing women's role in peace-building'. In the Beijing Draft Platform of Action, of the twelve sections on Strategic Objectives and Actions, only one section (ch. IV E) is devoted to 'Advance peace, promote conflict resolution and reduce the impact of armed or other conflict on women'. Education is viewed as the major vehicle 'to foster a culture of peace that upholds justice and tolerance for all nations and peoples' that is essential to attain lasting peace. Of the 5 strategic objectives, one deals specifically with the promotion of 'Women's contribution to fostering a culture of peace'.

It is interesting to note that this section on peace in the Beijing draft document is relatively clean of bracketed texts (indicating that the formulation has been agreed to by the delegations of the participating countries at the previous preparatory meeting or prepcom), compared to the other sections. Most probably it is easier to come to a consensus when dealing with the goals and objectives of promoting and attaining peace. However, there is no explicit definition of what is meant by peace. One gets the impression that in these documents peace is defined more as an absence of conflict, of violence, of hostile acts, of war. As indicated in the title of this paper, I refer to the 'pursuit of peace', analogous to the 'pursuit of happiness', both of which in today's world appear to be illusive and elusive.

It is also important to note that UN conferences, in the view of some critics and sceptics, both among non-governmental organizations (NGO's) as well as members of some governments, would be just an event for the outpouring of meaningless, utopian and unfeasible rethoric by leaders of governments, were it not for the concurrent NGO Fora that has been the pattern of UN Conferences. The participants of these fora come by the thousands from all over the world, women and men, many or most spending their personal funds. They conduct their meetings and actions in a highly energetic, articulate and in many ways effective manner, showing their commitment to achieve whatever goals and objectives the conference is being held for. The NGO Forum on Women has always succeeded to attract a large number of participants. For example, at least 150 members (mostly women) from NGO's in Indonesia have registered for the Beijing NGO Forum, whereas at the NGO Forum on Social Development in Copenhagen last March, probably not more than 15 members of NGO's were present. The magnitude and impact on all human beings, of this global women's movement has probably not had any paralel in the history of humankind.

In this paper I will focuss on the demand for equality in participation in and benefiting from development, and then address the role and contribution of women in the pursuit of peace.

The Demand for Equality to Pariticipate In and Benefit from Development

The demand for equality has by far been the most fundamental aspect of the women's movement. As far as the history is concerned, the movement in the United States is probably one of the best recorded. We note that one of the earliest demands for equality was in the field of education. The women's movement at the time started around the 1800's and all the well-known women's colleges in the US were opened in the 19th century: Mount Holyoke in 1837, Vassar 1865, Smith and Wellesley 1875, Radcliffe 1879, Brynmawr 1885, while Oberlin already in 1833 opened its doors to men and women(8),

This emphasis on equal opportunities in education is a continuing theme into the present women's movement. It is clearly seen as the most pressing and crucial issue in developing countries. In 1990, the enrolment level for girls aged 6 to 11 was only three-fourths the level for boys of the same ages; for girls aged 12 to 17, it was only two-thirds; and for young women aged 18-23, it was less than one half the level for young men(9). These conditions have generated the strong call for special attention to be given to the education of the girl child, that was expressed in the 1994 Cairo International Conference on Population and Development (ICPD), and at the 1995 Copenhagen World Summit on Social Development.

Nonetheless, improvements are recorded in the conditions of illiteracy and participation in higher education among women, although inevitably, unevenly spread across the various regions of the world. For those recently completing school (ages 15-24), basic literacy rates of at least 70 percent have been achieved in most countries, while in many others there is near universal literacy at 90 percent or more. Improvements are also seen in higher education, where in countries like Australia, Canada, the United States, Eastern Europe, Latin America, the Caribbean and the western Asia, women actually outnumber men. Nonetheless, at this tertiary level women are still behind in Western Europe and Japan, and in the developing countries of Southeastern Asia, Oceania, and still far behind in sub-Saharan Africa, and central and southern Asia (The World's Women 1970-1995: Trends and Statistics).

The positive relationship between education of girls and women and the improvement of the quality of life, in particular life in the family, has been conclusively shown in one study after another. Educated women tend to have fewer children and these children tend to live longer due to their better knowledge of health care and nutrition. Statistically, there is evidence indicating that each additional year of a mother's schooling translates into a 5 to 10 percent decline in child mortality(11).

Today, the issue of equality, equity and women's rights spans all spheres of life: political, economic, social and cultural. As a matter of fact, the UN has a respectable track record of promoting equality and women's rights. In 1946, only one year after the adoption of the UN Charter (1945), the Commission on the status of Women was established to promote the political economic and social rights of women. Seven years later, in 1952, in the area of politics, the General Assembly adopted the Convention on political rights of women, the first global endorsement of equal political rights under the law, including equal right to vote.

A year earlier, in 1951, the International Labor Organization (ILO) adopted the Convention concerning equal remuneration for men and women workers for work of equal value. This was followed in 1960 with the ILO Convention concerning discrimination in respect to employment and occupation, further reinforced with the Declaration on the elimination of all forms of discrimination against women in 1967, and finally the adoption by the General Assembly of the Convention on the elimination of all forms of discrimination against women (CEDAW) in 1979, which became operational in 1981.

In the social field, as early as 1949, the General Assembly adopted the Convention for the suppression of the traffic in persons and of the exploitation of the prostitution of others. In 1957 there was the Convention on the nationality of women, granting women the right to retain or change their nationalities regardless of their husband's actions. Then there are the Conventions on consent to marriage, minimum age for marriage, and registration of marriages, adopted by the General Assembly in 1962. In 1993, we finally see the adoption by the General Assembly of the Declaration on the elimination of violence against women.

However, the principle of sovereignty of nations is strictly upheld regarding the ratification and implementation of these instruments. It is up to the governments of the Member States of the UN (as of September 1994 comprising 184 states, representing approximately 98% of the world's 5.63 billion people) whether and when they will ratify these instruments and how they will implement them. A chart of ratifications of international instruments of human rights, published by the UN (as at 30 June 1994)(13) showed that of the 5 instruments directly concerned with women, the Convention on the elimination of all forms of discrimination against women (CEDAW), has been ratified by 131 states and signed by 11 (the US has only signed it); the Convention on the political rights of women has been ratified by 104 states and signed by 5; the Convention on the nationality of married women has been ratified by 64 states and signed by 9; the Convention on consent to marriage, minimum age for marriage and registration of marriages has been ratified by 41 states and signed by 7; the Convention for the suppression of the traffic in persons, and the exploitation of the prostitution of others has been ratified by 70 states and signed by 4 (the US and UK have neither ratified nor signed it).

This picture clearly shows that the movement for women's rights still has a long way to go. Moreover, ratification does not guarantee implementation. For example, Indonesia has ratified the Convention on the elimination of all forms of discrimination against women in 1984, but a study (by researchers of the University of Indonesia) of its implementation 10 years later, found that the conditions of women workers showed little improvement. It is no doubt this wide discrepancy between the instruments to protect and uphold the rights of women and to promote their advancement, and the reality of their conditions in many countries, that has galvanized the women's movement and generated the overwhelming response on such a global scale.

Hence, what we see now is the demand of the women's movement for the consistent and effective implementation of these international instruments and all the principles and commitments as propounded at the various UN global conferences and summit meetings. As expressed in the Jakarta Declaration 'Women should have equal rights, obligations and opportunities with men in all fields and at all levels of development. Their empowerment and the improvement of their political, social and economic status are essential for human development, and self-reliance of women and their families'.

The Mission Statement of the Plan of Action in the Jakarta Declaration puts it very clearly: to achieve the equal status of women as participants, decision makers and beneficiaries in the political, economic, social and cultural spheres of life; to promote and ensure the human rights of women at all stages of their life-cycle; to create or reorient political, economic and social processes and institutions to enable women to participate fully and actively in decision-making in the family and community and at the national, regional and international levels; to empower women and men to work together as equal partners and to inspire a new generation of women and men to work together to equality, sustainable development and peace.

Hence, in chapter 111: Critical Areas of Concern, the issues on inequality and inequitable access, focus on economic activities, power and decision-making, health, education and literacy, while the other areas of concern focus on the feminization of poverty, the inadequate recognition of the role of women in environment and natural resource management, the inadequate mechanisms for promoting the advancement of women, the violation of women's human rights, the negative portrayal of women in the media, and the inadequate recognition of women's role in peace-building.

The basis for these demands and concerns has been reinforced by the Declaration on the Right to Development adopted by the General Assembly in 1986(14). This Declaration established 'an inalienable human right by virtue of which each person and all peoples are entitled to participate in, contribute to and enjoy economic, social, cultural and political development in which all human rights and fundamental freedoms can be realized'. From this reaffirmation that people are at the center of development follows that development should be sustainable and people oriented.

A major concern in developing countries, particularly the least developed, in the ability to fully exercise the Right to Development, is the impact of structural adjustment policies (SAP) on the disadvantaged, including women. This development started with the debt crisis of the 1980's? When debtor countries were made subject to the 'conditionalities' of international financial institutions, such as the World Bank and the IMF. This meant not only adjustment to surplus-generating policies, but more fundamentally the shift to a full market economy by deregulating economic activities, privatization and cutting back on state expenditure(15). The impact of these policies on women has been to reduce even further their access to entitlements needed to sustain minimal well-being(16). The development NGO's and those concerned with the conditions of women in general, have worked on this issue both in a rational (organizing scholarly meetings) and also more emotionally charged (protest meetings and actions) manner, as happened, among others, at the Copenhagen Summit last March, when speakers of the World Bank and IMF at the NGO Forum were

faced with a barrage of sharply critical questions and accusations. These actions show the continuing and increasing solidarity of the women's movement with disadvantaged, the vulnerable and the marginalized peoples in the world, and the drive towards a review of the development strategies hitherto followed in most developing countries.

The Pursuit of Peace

The pursuit of peace in the context of the culture of peace, is a fundamental and therefore long-term and continuously evolving endeavor, which has to do with the values embedded in the culture of a society, and the enabling environment where education, formal and non-formal and the socialization at home and in the local community, are viewed as the vehicle for the inculcation of ideas, attitudes and behavior conducive to building respect and appreciation for all human beings, irrespective of race, ethnicity, religion, gender, age and socio-economic status. It also includes building respect and appreciation for the environment, nature, flora and fauna and all living creatures around us.

Using this approach, we can distinguish peace conditions into two broad dimensions: the individual/personal and the collective dimension, distinguished again into the family/domestic environment, the community, society, the national and international environment. Basic to peace conditions is the concept of human security, a concept elaborated by the UNDP in their Human Development Report 1994 (henceforth referred to as HDR 94), which is defined to have two main aspects. First, safety from such chronic threats as hunger, disease and repression, and second, protection from sudden and hurtful disruptions in the patterns of daily life, whether in the home, in jobs or in communities. No one country, whether rich or poor, developed or developing can be free from such threats; they can exist at all levels of national income and development. Human security also means that people can make their choices in life safely and freely, in relative confidence that the opportunities they have today are not totally lost tomorrow (HDR 94: 23). In other words, human security also means certainty in life choices, chances and conditions.

The concept of human security is further elaborated into seven main categories: economic, food, health, environmental, personal, community and political (HDR 94: 24,25). The adverse impact on both men and women if these security situations are absent is obvious, but in some situations the conditions can be far worse for women. This is especially in the area of personal, community and political security. As indicated in the HDR 94 (p.30,31) regarding personal security: 'Perhaps no other aspect of human security is so vital for people as their security from physical violence. In poor nations and rich, human life is increasingly threatened by sudden, unpredictable violence'. Further, it spells out the special importance of personal security to women: 'Among the worst personal threat are those to women. In no society are women secure or treated equally to men. Personal insecurity shadows them from cradle to grave. In the household they are the last to eat. At school they are the last

to be educated. At work they are the last to be hired and the first to be fired. And from childhood to adulthood, they are abused because of their gender'. Some figures show their insecurity in the home and the family environment: it is estimated that in developing countries one-third of wives are physically battered; in India, women's groups claim that there are 9,000 dowry-related deaths each year, and the government estimates that for 1992 the figure was 5,000; one woman in 2,000 in the world is reported to have been raped; in the US there were more than 150,000 reported rapes in 1993 alone; sexual harassment in the work place is common.

The situation of community security (HDR 94: 31,32) refers to the fact that most people identify themselves and/or are identified by others to belong to a certain racial or ethnic group. As most nation-states today are pluralistic in nature in regard to their population, people live in societies that consist of a variety of race or ethnic groups. There are very few states that do not have majority-minority group situations. Moreover, due to the large numbers of migrant workers invited to work in western European countries during the late 50's and through the 60's, there are today sizable communities of people who are of a different race and religion from the majority Europeans. In the last few years violent acts have been perpetrated to them. The most tragic and horrifying is no doubt the continuing inter-ethnic and simultaneously inter-religious war in the former Yugoslavia. Atrocities have been and are still committed by all sides in the conflict, but by far the worst are those perpetrated to the Bosnian Moslem women.

In this context, the recent revelations about the so-called 'comfort women', the women who were systematically enslaved to provide sexual services for the Japanese army during World War II, is a case in point. The recently published (Allen & Unwin, 1995), well-documented book by George Hicks, an economist and writer based in Singapore and Australia, entitled The Comfort Women. Sex Slaves of the Japanese Imperial Forces, relates vividly the incredible suffering and inhuman treatment endured by more than 100,000 women across Asia (including some western women who were living in the camps set up by the Japanese occupation authorities during the entire war period), who were forced into prostitution by the Japanese imperial forces. What is even more incredible is the fact that the Japanese government has been able to cover up, and until recently consistently deny, any implication of the government in these actions. As Hicks observes, 'It has taken half a century for these women's ruined lives to become a human rights issue' (Hicks, 1995: xi).

In terms of political security (HDR 94: 32,33) there is the international situation of repression of the people by the state, where the basic human rights of the people are not honored by the state. A 1993 survey by Amnesty International showed that political repression, systematic torture, ill treatment or disappearance was still practiced in 110 countries. Political security also relates to the fact that the decision to get into conflict situations is usually made by the leaders in government, who are still mostly men, without consulting the people, including the women, while in these situations it is the women and children who suffer first and foremost from the consequences. The multitude of haggard-looking refugees, mostly women and children, who fill the TV screen almost every evening, attest vividly to this.

Moreover, there is now a fundamental shift in the characteristics of violent conflict situations or systemic violence up to an including war. First, there is the shift from conflict situations between states to within states, i.e. civil wars. Second, there is a decided shift in the type of casualties, from military to civilian. Third, most of these wars are fought with relatively low technology weapons, but the y kill or maime just the same.

Dan Smith of the International Peace Research Institute in Oslo (17) observes that in 1993 there were 52 wars recorded, involving 42 countries. Furthermore, there were 37 countries with widespread and even endemic political violence, without being called a war situation. By far the majority of these countries in conflict were located in the Third World, and almost all of the 52 wars are civil wars. The wars that in 1993 were between different states actually started as civil wars in Yugoslavia and the USSR before their disintegration. Then there are the wars in Somalia, Tadzhikistan, Angola, Liberia, Sudan, Rwanda; in Asia there are the continuing political violence in India and Sri Lanka, not to mention the Tien-An-Men massacre in Beijing in 1989.

The shift from military to civilian casualties in these violent conflict situations started in this century. Whereas at the beginning of this century some 85 to 90 percent of war casualties were still military personnel directly involved in the war, during the course of the twentieth century war has been taken to the civilian population. The civilian fatalities as a proportion of all deaths in World War II are estimated to range from one-half to two-thirds, including victims from death camps and massacres as well as civilians killed in bombing raids on cities. The figures for today are even more grim: it is estimated that three-quarters of war-related deaths are civilians, and if refugees and wounded are included, some estimates indicate that about 90 per cent are civilians. In terms of absolute figures, this translates into an estimate of more than twenty million fatalities in war since the end of World War II. During 1993, a cumulative total of four to six million people may have been killed in various wars all over the world. If internal displaced persons and international refugees are included, as many as thirty million people may have been forced to flee from their homes through the impact or the fear of war. Moreover, in recent years, the worst famine, among others in Cambodia, Ethiopia, Mozambique, Somalian, Sudan, have all been caused or exacerbated by war (Smith, 1993: 3).

If these civilian casualty figures, were more gender-specific, it should be clear that a highly disproportionate number of them would be women and of course also children. The bleak picture of refugees shown nightly on the TV screen confirms this observation. The little information we have on this situation shows that in the former Yugoslavia, since 1981 more than 130,000 have been killed and more than 40,000 helpless women reportedly raped in what was named 'ethnic cleansing'. In Somalia, in 1993, there were up to 10,000 casualties, about two-thirds of them women and children.

These facts and figures show conclusively, that women have the most, or perhaps everything, at stake in the pursuit of peace and to work towards peace-building and the avoidance of violent conflict situations. As mentioned earlier, in the Jakarta Declaration, one

of the critical areas of concern is the 'inadequate' recognition of women's role in peace-building'. It is noted that there is an underrepresentation of women in decision-making bodies at all levels, particularly in international negotiations on the peace process, whereas women, often being the worst victims of war and armed conflict, could contribute constructively in the search for alternatives and steps towards peace-building and conflict resolution.

A perusal of the list of women peace prize recipients in The World's Women 1970-1990, 1991 (p.37), a United Nations publication, shows how few women have been recognized as contributors to peace efforts. Of the Nobel Prize Laureates, first awarded in 1901 until today, there were 9 women: Bertha von Suttner (1905), Jane Addams (1931), Emily Green Balch (1946), Mairead Corrigan (1976), Betty Williams (1976), Mother Teresa (1979), Alva Reimer Myrdal (1982), Aung San Suu Kyi (1991), Rigoberta Mengu (1992) (from 1901 to 1987, 87 prizes were given, with only 8 per cent to women).

The UNESCO has shown a better performance in this regard: of the UNESCO Prize for Peace Education, three or one-third of the nine prizes (from 1981-1989), were given to women, whereas of the Peace Messenger Awards, from 1987-1989, 26 or only 7% of a total of 375 prizes were awarded to women's organizations.

As a matter of fact, women have been prominent in the peace "movement since its very beginning and continuing until today. Johan Galtung (18), in his expose of the peace movement, mentions women first as one of the major actors of the movement,' especially since the 1980's. He considers women's contribution to the peace movement invaluable, as they generate a holistic perspective by refusing to reduce the matter of war and peace to tactics in disarmament negotiations or the mere counting of rockets. More factors are taken into consideration and the problems are viewed in a broader context, which forces men to adopt a similar perspective. Moreover, he contends, women have the unique ability to use new forms of language, new ways to act and speak on matters of war and peace.

As noted earlier, the concern today is not about inter-state wars, but the potential of disintegration of nation-states. The spectre of 'failed nations' is very real, considering the break-up of the USSR, Yugoslavia, Czechoslovakia since the end of the Cold War, and much earlier the partition of India, and subsequent y of Pakistan. Then there is the continuing conflict in Northern Ireland, Belgium, Canada and in Asia the tenuous situation in Cambodia. There are even some speculations that the wide disparity in economic growth of the Eastern part of China compared to the Central and the Western part, will generate friction that may eventually lead to a break-up. What these developments and speculations indicate is the fragility of nation-states, the brittleness of the cohesion that keeps them intact. Hence, the problem is basically the lack of social integration.

The problem faced by both developed in developing countries today is clearly how to create an enabling environment that promotes social integration, one of the four dimensions of national integration (the other three are political, economic and cultural integration). In this context, social integration is seen as the condition and the evolving

process, whereby the diverse groups in society, sharing the same institutions and the same core values of solidarity, responsibility and freedom that form the spiritual and moral foundations of a society, function as a coherent, harmonious and interdependent whole, striving towards the common objectives of spiritual and material well-being of all(19). Boutros Boutros-Ghali, the UN Secretary-General, has defined socially integrated societies as ‘... those that are able to accommodate different and divergent individual and group aspirations within a flexible framework of shared values and common interests’ (20).

The key to social integration is therefore respect and appreciation for diversity, cohesion and inclusion. Cohesion refers to how well the components of a social entity mesh, how well individuals and sub-groupings cooperate and avoid undue conflict, while inclusion refers to the extent to which all members of a society share in its benefits, find protection under the rule of law and are able to participate fully in economic, social, cultural and political life (21).

These are concepts that do not come naturally to people, especially in a heterogeneous society with a variety of racial, ethnic, religious groups. These are notions that are learned, experienced and followed through example. Here is where education, formal and non-formal, and socialization in the, home, the neighborhood and community, and religion play a decisive role for the creation of an enabling environment for the attainment of social integration. It will also be helpful to search within the culture of a society for those values that contribute to cohesion and respect for diversity. The inculcation of these notions are crucial for the creation of a social environment , where peace will be considered a desirable value and conflicts will be resolved by peaceful means.

The Jakarta Declaration, in the section on ‘Education for Peace’ (p. 47), states in the strategic objective: To ensure that peace education is made an integral part of the socialization process within the family and in the society at large. The action to be taken are recommended to be as follows: reflect women’s perspectives and involve women in the design of peace awareness and peace promotional programs in the media, educational systems and the community. Undertake measures to discourage the presentation of excessive violence in the mass media. Another recommendation put forward is on peace research, with the objective to increase understanding of the root causes of conflict situations and the potential role of women in peace-building and conflict resolution.

In this context, special attention should be paid to NGO’s, both the national and international, as important actors in the pursuit of peace. With the increasing recognition of many governments, also in the developing countries, that the efforts towards sustainable and people-oriented development needs to be done in partnership with NGO’s that are part of the emerging ‘civil society’, NGO’s will have the opportunity to influence governments towards a strategy of development that is conducive to the creation of a peaceful social environment.

The NGO's that are part of the women's movement, are in an advantageous position through their global network, to cooperate with the peace movement and the environment movement (in both movements women figure prominently), to influence governments and communities to search for peace and for peaceful solutions of conflict situations. Undoubtedly, together they could be a formidable moral and moderating force in today's world, parts of which are on the brink of social disintegration.

NOTES

01. Letter of Pope John Paul II to Women, signed. and dated 29 June, 1995. Vatican City: Libreria Editrice Vaticana, p. 9,10. This document was sent to the office of the representative of the Vatican all over the world to be made available to relevant institutions and individuals.
02. I herewith extend my thanks to Mr Vladimir Zharov, Director Basic Sciences Division, for sending me, at my request, the reports of the three previous UNESCO Science and Culture symposia, held in Venice in 1986, in Vancouver in 1989 and in Belem in 1992.
03. Judith Hole and Ellen Levine, 1971. Rebirth of Feminism. New York: Quadrangle Books, Inc., especially Chapter 5: Resistance to the women's movement.
04. Betty Friedan, 1963. The Feminine Mystique. New York: Dell Publishing Co., Inc.. This book, as perhaps no other at the time, jolted American women living in suburbia into consciousness that they should not be satisfied with their role as wife and home-maker only.
05. UNIFEM, 1995. The Human Cost of Women's Poverty: Perspectives from Latin America and the Caribbean, p.7. Noeleen Heyzer, Director of UNIFEM, who wrote one of the two forewords to the book, has a long and impressive history of research and works on and with women.
06. Ester Boserup, 'Equally versus Development?' in Development Forum, Vol. III, n°6, August-September, 1975. Dr. Ester Boserup is an economist from Denmark, well-known for her book Women's Role in Economic Development (New York: St. Martin's Press Inc., 1970).
07. United Nations, Economic and Social Commission for Asia and the Pacific, Second Asian and Pacific Ministerial Conference on Women and Development, Jakarta, 7-14 June 1994. This was one of the regional conferences held in preparation for the UN World Conference on Women in Beijing in September, 1995. At this regional conference close communication was possible between the official conference and the NGO Forum, as they were located at the same venue.
08. Judith Hole and Ellen Levine, op.cit., p.2.
09. UN Department of Public Information, 1995. Social Summit Issues Papers, Women: Investing in the Future, p.2. The Issues Papers are part of the Fact Sheet Series, that are very useful as they succinctly present the core issues of the Summit, from the perspective of the UN specialized agencies and programs as well as some of the smaller UN entities that focus on specific topics (henceforth referred to as Social Summit Issues Papers).

10. United Nations, The World's Women 1970-1995: Trends and Statistics. This is a regular publication of the UN.
11. Social Summit Issues Papers, Education Empowers, p. 2.
12. INSTRAW and UNIFEM, 1995. Women and the UN: 1945-1995. This is a fact sheet showing chronologically the actions taken and conferences organized by the UN and its agencies, related to women.
13. United Nations, 1994. Human Rights, International Instruments. Chart of Ratifications as at 30 June 1994, p. 10,11. This chart has a listing of 25 instruments, of which 5 are directly concerned with women.
14. Social Summit Issues Papers, Human Rights and Social Development, p.3.
15. UNRISD, 1995. States of Disarray. The social effects of globalization. An UNRISD report for the World Summit for Social Development, p. 3, 4.
16. Social Summit Issues Papers, Women: Investing in the Future, p. 3.
17. Dan Smith, 1993. War, Peace and Third World Development. "UNDP, Human Development Report Office: Occasional Papers 16, p. 1,2,3.
18. Johan Galtung, 1984. Er zijn Alternatieven! Vier wegen naar vrede en veiligheid. Amersfoort: De horstink, p. 27. (Translation by Martin Gerritsen from There are Alternatives (1983).
19. Mely G. Tan, 1995. 'Bhineka Tunggal Ika. Social Integration in Indonesia', p. 140, in Benno Werlen and Samuel Waeltly (ed.), Kulturelle und Raum. Chur/Zurich: Verlag Ruedger, p. 139-153.
20. United Nations Department of Public Information, Notes for Speakers Social Development, p. 46.
21. Ibid p. 49.

CULTURE, SCIENCE AND PEACE

by Santiago Genovès

INTRODUCTION

From the start, I doubt about the title of the symposium, about the title of this essay. Knowing that tradition, use, have a weight, I cannot stop pointing out, nevertheless, and in my humble judgement that, there is an initial mistake; UNESCO: 'United Nations Educational, Scientific and Cultural Organization'. Education, Science and Culture at a same level? Where, I ask, and I wonder, can exist, exists, Science and Education without Culture? Culture, I think, observe and say, includes everything man does: economy, science, education, sports, politics, ecology, generalized and institutionalized war, industry and commerce, religion, languages, etc. Culture, which starts, as we well know, when around four and a half million years ago, we started to play, yes, to play, with some pebbles -which afterwards we start to transform, or with osteodontocheratic industry-, it is the great umbrella, that man invents and under which everything that man does is and stays included (1). Culture covers and includes everything man does -material, thought, or even imagined-. That is: what cockroaches, elephants, tigers, crocodiles, sharks, etc. don't do or cannot do, even though there exist aspects of evolution, either biological or behavioural, for which the study of the rest of biology or the behaviour of the rest of the animals -ethnology- is very useful, without transpolating too much and unduly, as it is frequently done. I express myself in such a way, because to go towards a happy future -theme of this symposium-, one must perfectly understand that, while science constitutes the activity of some few million who practice it, Culture is the patrimony of all the approximately five thousand million and a half which inhabit this only and lonely raft called Earth. That Culture, as it generally is understood, is only for the cultured, from the University of-the United Nations, the Opera of Paris, the Palace of Fine Arts in Mexico, the Carnegie Hall in New York, is obviously partial, for it only constitutes a limited and exiguous aspect which leads us where we are today, and we do not want to remain in it in the future. In the same way, up to now, the planet is ruled by, fundamentally, economic-political military reasons and absurdities, isolated or intertwined, ill-fatedly forgetting that Culture embraces much more: Everything.

(1) We have in Mexico, of rather recent creation, the CONACULTA (National Council for Culture and Arts). Where does art exist or where can art exist without culture? In one case as in the other, it is as if I would say I am giving a lecture on spleen, pancreas, liver, toe nails and the human body, Something else is: 'The human body, with special reference to spleen, pancreas, liver and toe nails'.

In Venice (1986), Vancouver (1989), Paris (1991) -where I was- and Belém (1992), we placed ourselves, explicitly, in the interdisciplinarity, as it should be, without intentions to the past encyclopedist of Diderot: another time, another sense of globalization, another circumstance (2).

Now, here, it seems, also, Which is based and founded on feed-back discovered by Wiener. That is , in the relationship of everything with everything, either if we discovered it scientifically or not. According to Haissenberg's principle: the observer affects the thing observed, knowing that, ultimately, objectivity y is an intersubjective invention of man, or as the great Bergamin told us: "If I had been made an object, I would be objective, but I was made subject".. Subject, I add, to integration, feed-back and interplay of genetics and environment -natural or created by man.

DISCUSSION

Paleontologically, we come from very far away, so as to avoid being lost or driven away too far, I make reference only to the vertebrates we are.

The first vertebrate is found in sandy beaches in Italy and, afterwards, in other places. Logically, we can think that for the amphioxus everything was all right. There they were in the sea and near the land. But no -chance and need, Monod (3)-, some amphioxus become fish: three-fourths of the Earth were for them! But no: some fish become amphibious. We can think that finally they have everything, sea and land! Well no: Some amphibious become reptiles that, during several thousands of years, -the small ones and above all, the large ones -dominate the solid part of the Earth-. well no: some reptiles become birds -which are still flying-, and some other become mammals. The thing does not stay there. Some mammals become primates, some primates become hominoids, some hominoids become hominids and some hominids -pebbles, osteodontocheratic industry- become Homo faber, and here we are: If we have or have not arrived to become Homo Sapiens, as we pompously auto-name ourselves, remains still to be seen. To try to reach this taxonomic linnean category in the future, is the reason why we are here, called by UNESCO.

In sensible studies on Evolution, from Darwin and Wallace, going through Huxley's synthesis, until the arrival of Watson and Crick and the mitochondrial ADN, going further and further into the depths of time, into the depths of our biology, we nevertheless found ourselves in the joint action of Natural Selection, Survival of the Fittest. Mutations, Weinberg's law and isolation, as the factors and processes, which, integrated, produce evolution.

(2) For that we have to congratulate most warmly UNESCO that organizes them.

(3) This, closer or further away, from some valid criticisms which have been made to the concept of ' monodinan' evolution.

The Swede, with a Portuguese name, -Lima da Faria-, recently goes even deeper and further: Evolution without selection with physical-mathematic bases. Even if he is right or wrong, we had forgotten von Kropotkin who, at the beginning of the century, showed us that cooperation and not intraspecific struggle constitutes the fundamental bases of evolution. We are several who have taken his ideas and have completed and widened them(4). It is equivalent (Venice 1986) to interdisciplinary cooperation, both at present and in the future (5). Going ahead, I will say that we knew, neurologically, that w.c. possess brain zones (Broca area, Wernicke area, etc.) which are directly related either to sensations or to types of behaviour. Afterwards, more recently, Sperry shows us we have two brains: imaginative, holistic and intuitive, the right one; logical and reasoning the left one. Knowing beforehand that from up to down (neocencephalon, mesocencephalon, rhinencephalon) there is abundance of communication, it remains that between the right and the left one few communication goes through. What was recently found is that through the corpus callosum, which was believed to be almost only a support element, there also exists a passage of abundant information, That is, that we have a brain. That in our behaviour, that of everyone, -politicians, anthropologists and scientists included- feelings, passions and emotions are as important in our behaviour, as reason and logic(6), no matter how objective, logical and reasonable we pretend or try to be. Why? Because the world progresses thanks to logic and reasons, but it lives for emotions, feelings and passions. It is not St. John of the Cross or St. Theresa, but it is Einstein himself who says to us: 'Imagination is more important than knowledge', or, 'Gravitation cannot be made responsible for people falling in love'. Linked to this, it suddenly happens that we live, everyone of us, completely in direct need of adventure, because the physical adventure that formed us and conformed us, from the faraway past, was lost less than a century ago, with the advent of the great discoveries in communication, direct -trains, huge steamboats, automobiles, planes- or indirect - TV, radio, the adventure that our grandparents still lived and told us about, is not there any longer (7).

(4) If the strong ones were constantly fighting among themselves, the weak would be the ones to survive, and they would inherit, if not the Earth, at least the strong ones' widows, it is valid and, with application both to the theory field and to evolutionary data, and to the, somewhat despiced and, up to a certain point, controlled 'Thirld World'.

(5) We declared in Venice that, for progress, Science, Technology, Art and Traditions, must go intertwined from below, without one being more essential that any of the other.

(6) If here, in Tokyo, the most scientific scientist would come to give us some lectures, let us say, Einstein, maybe a few hundred thousand 'intellectual' scholars would attend to his lectures to listen to him -I say would go-, Shirley MacLaine would fill up the greatest sports stadium in the city.

(7) Today, in Chelsea, in Montmartre, in the Mexican Pink Zone, or in the one found here in Tokyo, we can see youngsters, or not so young ones, dressed up for adventure, as the ones that went to hunt lions in Africa used to dress -and I saw them in photographs-: with boots up to their knees; a great coat of leather and even a species of salakoff over the head. Dressed up in that way 'for adventure' -which they no longer have- all they can do is to go into a fast food restaurant and ask for a coca-cola.

Looking for adventure we go into drugs, promiscuous sex, badly made, violence and even the game of being in political power as adventure. We are men and women because, through culture, we got out of the ecological niche in which nature in evolution, only biological, placed us. Through culture we gave a great leap, qualitatively and quantitatively much greater than those described from the amphioxus -the first vertebrate- up to now. Extra-biological infinite and unlimited adventure that -for lack of true and real culture for everybody- we have no learned maybe, even to conceive(8).

Yes, evolutionary, we are interaction, perennial feed-back among hands, brain and pebbles (hands/brain/pebbles) for a common route to be navigated, we have to conceive ourselves as the constantly balanced cultural integration of Science, Technology and Humanism (Science/Technology/Humanism). It is the great adventure, unlimited adventure, which we need to spread all over the world, through the massive means of communications.

The great cultural adventure of thought and action, conscious of our human limitations to achieve a total objectivity. In interdisciplinarity which leans both in quantitative and quantifiable, as in qualitative, -hardly measurable and calibrated-. In the real reality of the little we know, not with standing all our studies and experimentations. In the adventure of essential cooperation, both in the scientific level and in the extra-scientific levels, always, serendipically, in the constant search for greater knowledge; and, as regards scientific investigation, which almost nothing, or very few, from what we know today will be totally valid tomorrow, facing the reality of new scientific knowledge. That science is not born from certainty, but from doubt and ambiguity, in well understood philosophy of science.

As regards one of the most peremptory themes to solve, generalized and institutionalized violence(9), I made (Mexico-UNESCO-Spain, producer TELEVISA) a T.V. series consisting in five programs, one hour each, Expedition to Violence to which I leave here.

(8) I represent a clear case: my 'fame' in the world does not lay or come from all I have found out, in science, through the three rafts (RAI, RAII, and, above all, Acali). My fame comes from the enormous adventure -which does no longer exist- they created and in which I was.

(9) To my best knowledge and understanding, the other ones would be: a) demographic explosion,; b) ecological destruction; c) the calling others as 'things' -racism; '2nd .- sex', etc. - essence of Sartre's existentialism, and; d) the deficit of socialization during the first years.

Whether we like it or not, whether we want it or not, T.V. constitutes, today, the most powerful and penetrating medium to transmit our findings -in a pleasant manner, otherwise we are not seen or heard- to the planet. Our cultural view, integrated and interdisciplinary about, with natural and normal doubts, about which is the path towards the future for the greatest happiness and understanding among all. This places us under the norm to try to understand more and to judge less(10). Of cooperation for the survival and development of all that navigate in this lonely and solitary raft called Earth, which belongs to everyone: scientists and workers; of black, white or yellow people. To go beyond, partial -either conceited or not- political solutions, economic and/or military solutions that history shows us, they have never been transcendent y valid, and only, by themselves, momentarily, unilateral and in the last instance vane and commonplace.

I think the role of the scholar is to study, being, always, critical of himself, and afterwards, to transmit what he has found, if it turns out to be useful, elegant and beautiful, so much the better.

I consider this is the common path on which to travel to a feasible future.

‘There wage furious war, blind kings
for one more small plot of land
which I here have as my own
How much the untamed sea embraces
to which nobody imposed laws!

That my treasure is my ship
that freedom is my god
my law, force and wind
my sole country, the sea’.

Yes; the sea of perennial search for knowledge, integrated and interdisciplinary, it is our role as scientists, in the only and maximum environment exclusive to man: Culture, for the clear benefit of everybody.

(10) Very veracious truth of Nietzsche: ‘When one cannot understand, one starts to judge’.

SCIENCE AND BUDDHISM

by Hayao Kawai

1. Introduction

In this century science had made enormous progress. Linked with technology it has brought modern people incredible efficiency and convenience. However, it is also true that we worry about the destructive potential of modern science and technology. This is due to the fact that human beings have started to acquire knowledge about several new fields; nuclear energy, cosmic space, and molecular biology. If we loose the necessary levels of control humanity might face the danger of its own total extermination,

Considering the extraordinary accomplishments of modern natural science, I am afraid that the title of my talk 'Science and Buddhism' might sound anachronistic. Can buddhism, such an old thought, have meanings nowadays especially in relation to natural science? My answer to this question is of course quite positive. Buddhism developed its thought in a direction which was completely opposite to natural science. In this sense, I think, it will serve not only as a compensation but also as a means of finding new dimensions in natural science.

2. Illnesses of modern people

In order to expand on the ideas I mentioned above, I would like to start with some very concrete problems that I often face in my work as a psychotherapist. For example, once I met the father of a high school boy who had not been to school for a long time. The father said to me, 'Nowadays human beings can go to the moon and come back safely when somebody merely presses a button. Why can't you find the proper button to press which will make my son go to school?' This example shows a typical problem into which modern people tend to fall. The father wants only to find a way to control his son and forgets about the father-son relationship. He wants to operate his son like a machine. Sensing this loss of related feeling his son can do nothing but resist his father consciously or unconsciously. We have many versions of this kind of psychological problem, which I call 'loss of relatedness'. I shall discuss later how this tendency is to some degree intertwined with the progress of modern science and technology.

The second point I would like to mention is the increase of diseases which are in some senses located in borderline states. A typical one is psychosomatic diseases. One can never judge the primal causes of these diseases which are found in either the psyche or in the soma. As you know modern medicine developed under the premise of a distinct division of the psyche and the soma. With this premise medicine has made such progress that many diseases have lost their dominion over humanity. However, this division seems to play a role in increasing psychosomatic diseases. One can even say that this phenomenon is a kind of revenge of nature on humanity.

In view of the illnesses of modern people I suspect the rapid progress of modern science has something to do with it. In order to think about the problem we should examine the nature of modern natural science's methodology.

3. The methodology of natural science

In the history of mankind people in different ages and places had differing knowledge concerned with what we now call 'science'. However, the exact methodology of natural science was only established recently in modern Europe. The most important point is that an observer must be separated from the observed phenomena. In this way the result of the observation becomes independent of the observer, namely, universal. The clear distinction between subject and object is an obvious necessity. This is a great accomplishment of modern European culture, in which it can claim the concept of universality as its scientific discovery.

One of the important characteristics of science in this century is that its knowledge is closely connected with technology. When technology based on natural science is developed it is available to anyone. This is because of the 'universal' premise of natural science, so that regardless of individual differences anyone can use it: so long as one follows the manual. There is no need of any special skill or ability. As the father of that same high school boy said, a human being can go to the moon by just pushing buttons.

With the big successes of modern technology people have tended to apply the same methodology to other people. Everybody wants to know the best 'technique' to control or at least to manage others. There has been a flowering of 'how to' knowledge: how to raise a good baby, how to treat old people, etc. It is true to a certain extent that they are of use, however, if we rely too much on this sort of thinking, as mentioned before, people suffer a 'loss of relatedness'. When people are in a group struggles occur over who can control the others, in a similar fashion if there are no 'related feelings' technical solutions simply breed struggles between competing technical solutions.

4. **Studies of human beings**

Because of the huge success of modern science and technology, studies of human beings have tried to imitate its methodology. Social science and human science have followed in the wake of science and technology. When a researcher succeeded in objectifying some aspect a human being the method can achieve reasonable results. But if we think of a person as a whole beings, the method of natural science does not work. A researcher, him-herself, is human, so that it is impossible to make a clear distinction between subject and object. The quality of the relationship between the subject and object always influences the results.

Take, for example, my practical experience as a psychotherapist. If I meet a six year old boy with a complaint of hyper-activity who cannot concentrate on his work in the classroom. If I try to be as objective as possible and avoid any relationship with him, all I can say is that he is too insecure, of low intelligence and so on. However, if I try to establish a good relationship with him, so that he feels protected and is allowed to behave freely, his behavior will change. Here, the most important thing is not to observe the present situation accurately but to expect the manifestation of his inner possibilities. The relationship between subject and object is very important, without which no positive phenomena would occur in psychotherapy. Moreover this is true outside of psychotherapy, as also in education and some parts of medicine, where we have to consider a person as a whole, the subject-object interrelationship is a very important factor in the study.

The next point is, I am aware, controversial. However, I would like to comment rather briefly about what I call 'acausal constellations'. During the course of psychotherapy there sometimes occurs accidental phenomenon which miraculously help to cure, or symptom amelioration, of clients. We cannot give any clausal explanation but find that some events or a series of events create a good constellation which has a deeper meaning in the. life of the client and sometimes also for the therapist. I would like to point out that this kind of phenomena occurs most likely when I give up conscious efforts to control or operate clients, and just wait to see if anything will happen spontaneous y. Or it may be better to say, if I have this king of attitude I am more likely to recognize meaningful constellations which other people would have missed.

Take, for example, psychosomatic diseases and the occasions I have met them with the above mentioned attitude without any intention of exploring the 'causes' of the illness, or to give advice, or medical drugs. In the course of psychotherapy while I do not 'cure' these patients their symptoms have spontaneously disappeared.

This approach is completely different to technology. In technology everything is very clear. What one should do and what kind of responses you get are all decided beforehand according to the operating manuals: specific action obtain specific results. On the contrary there is no manual in my approach to people as I simply wait for the spontaneous activity to come out of the individual's inner possibilities. Although I have some expectations I cannot say what will happen next exactly. In this sense, my approach is heuristic and I even feel creative. Clients are cured by their creative works.

All those creative works are supported by or fostered by the relationship between therapist and client.

5. Basic premises of Buddhism

As I recognize the importance of relationships I am very impressed by Buddhist ideas. Here I would like to introduced Professor Toshihiko Izutsu's philosophical considerations based on the Hua-yen (Kegon, in Japanese) school (although I think these ideas are fairly common to other Buddhist schools).

In the Hua-yen school the most important point that the Garland sutra stresses is that every being does not have its own self-nature. For example, I am here standing as Hayao Kawai, but the Garland sutra says, I have nothing by which I can really define or identify myself. Thus how can I be myself: different from others? The Garland sutra answers that I am myself because of the infinite relations that exist with others.

It is completely different from our daily way of thinking. We think that everything exists with it won nature and then everything has its own relations with others, But the Garland Sutra's idea begins with relationships and how these relations define each being.

The idea stems from, I think, a conscious state which is different from our ordinary consciousness. In ordinary consciousness each object A, B, and C exist separated from each other. However, if we change the level of consciousness the demarcations between A and B, or B and C become blurred. If we move the level of consciousness down without losing its clarity, everything becomes one being which one cannot name, The whole being is called Nothingness because it has no name, but actually one can say it is everything.

After reaching to the bottom of consciousness the level of consciousness returns to the ordinary state, in which instance the whole being manifests itself as separate objects or creatures. However, each object is a manifestation of the whole being. This is predicated in Hua-yen philosophy as 'the Arising of the True Nature'. This fact is told in the Garland sutra in which even a single speck of dust floating in the air includes thousands of Buddhas. If we express it in an equation it will be as follows:

$$\begin{aligned} A &= f(a, b, c, d, \text{-----}) \\ B &= f(a, b, c, d, \text{-----}) \\ C &= f(a, b, c, d, \text{-----}) \end{aligned}$$

If we use semantic thinking the 'signifie' is always everything (a, b, c ---) whereas the 'signifian' differs, like A, B, C. In order to explain this strange fact Hua-yen employs the aspects 'powerful' and 'powerless'. 'Powerful' designates the presence of a positive, manifest, self-asserting, and controlling element whereas 'powerless' denotes the opposite: passive, seclusive, self-negating, and subservient.

Please recall here what I said about my “psychotherapy when I abandon active intentions and simply wait on events. This attitude activates the ‘powerless’ components so that there occurs a change of personality. Even though everybody labeled him or her as nothing but a juvenile delinquent, or alcohol dependent, if a therapist’s attitude is passive, self-negating, and seclusive enough interesting changes occur. Powerless elements begin to manifest themselves.

As you see this is completely different from the way of modern science and technology, which is likely to control or operate others. The Buddhist thought which I described above is diametrically opposed to modern science. Our everyday consciousness is very much refined by modern science in the direction of discrimination, whereas in Buddhism it is in the direction fusion.

If we are completely bound by modern scientific thinking Buddhist ideas are taken as full of nonsense or confusion. But I think now as a culmination to the progress of modern science we need Buddhist ideas as a necessary means of compensation.

6. Where can Buddhism and Science meet?

Even if we acknowledge the importance of Buddhist ideas how can we best manage them in our present era. I have no intention of negating modern science and technology, which play so important a role in our daily life. But is it possible to accept both science and Buddhism at the same time’?

One of the devices, I think, we should use is to try to release science and technology from the restriction of modern scientific methodology. We need an expansion or widening of the definition of science. Here, we admit the existence of a relationship between subject and object, and of phenomena which are observed during altered states of consciousness. Although we have to be very careful in describing the kind of relationship we had, and what level of consciousness was involved we report the results. Otherwise there emerges complete confusion. And when describing the quality of the relationship we should not forget that there can be ‘relation’ in the Buddhist sense (in this sense I am glad that the word ‘symbiosis’ rather than ‘coexistence’ is used in the title of this symposium).

I imagine that we may establish a science started from ‘relation’ as the basic components, instead of one which separates each of the objects.

My thinking is based on the premise that allows the multiplicity of reality. It is different from the modern scientific idea that ‘the truth is one’. Those who adhere to modern science will attack me, saying that I am a multiple personality or character upon whom nobody can rely. However, I have been thinking about this problem for a long time and recently received a huge boost to my line of thought. A prominent scholar in immunology,

Tomio Tada, said that in a human body the nervous system and immune system are mutually independent. Although there is no central system to control or manage them the human body manages to function quite harmoniously everyday. I thought it a splendid model. Like a body our psyche can maintain harmony without any center, and even though there exist various independent systems.

This model of harmonious coexistence without a center can give us a hint of how to think not only about the individual, but also about a group or people or nations.

UNIVERSALITY AND DIVERSITY IN SCIENCE, TECHNOLOGY AND CHANGE

by Yasunori Nishijima

A few years ago, a symposium was held in UNESCO Headquarters in Paris. The theme of the symposium was 'The Dialogue between Cultures'. I participated in the symposium, it was quite stimulating.

At that Time Dr. Eiji Hattori, who planned and organized that symposium, told me his plan of the next symposium on 'the Science and Culture' for commemorating the 50th Anniversary of UNESCO and the 20th Anniversary of the United Nations University in Tokyo.

A few weeks ago, I spoke over the phone with Dr. Hattori. Then, I mentioned 'University and Diversity' just off hand. It became my title of this speech as printed in the program me.

Mr Paulo E. de Berrêdo Carneiro wrote: 'It is UNESCO's vocation to be a perpetual question mark'. He was closely associated with the UNESCO publication of 'the History of Scientific and Cultural Development of Mankind'.

The perpetual question mark on nature, on life and death, on humankind, has been the driving force of science and culture since the origin of humankind.

Archaeological findings indicate even during the Ice Age human beings were not simply struggling against nature for survival but observing nature, thinking about nature and created various means to express the thought and hope for the future in sculptures and paintings. History of science and culture of humankind has its origin at the very beginning of mankind. It is rooted in the essential nature of humankind.

Accumulation of knowledge and creation of new tools, new materials, new ways of recording and communicating have the history of tens of thousand years of ancient technology. It is so fascinating to see the great expressions and achievements of our ancestors. It is the history of challenge with creativity, however ancient, it is never primitive.

Ancient Greek philosophers, based on the accumulated knowledge and wisdom of the ancient cultures in Orient began to crystallize the thought on the structure of the Universe.

In the island of Sicily, a philosopher and poet, Empedocles, expressed the essential element of nature, that is, fire, water, air and earth.

Aristotle divided the Universe in two parts, that is, above the moon and under the moon.

Above the moon, the heavenly bodies has perfect eternal order, with perpetual circular motion.

Under the moon, elements transfers from one to the other through the variety of natural properties associated with the elements, hot, cold, wet, dry.

He also denied in nature the absolute emptiness and also denied the sense of infinity.

It is very interesting to think, when we speak about the environment today. The four elements are still the essential concern, and we realize the finiteness of the environment on earth.

Some years ago, I visited a little church in Toscana, Italy. I saw the writing on the wall chiselled on the stone:

***'HINC DEVS HOMO
ATQUE HOMO DEVS '***

meaning *'Here God is Man and hence Man is God'* .

The Renaissance initiated the revolution of natural science. Truth of nature was sought through observation and experiment.

New tools for scientific research were invented utilizing the development of technology. The telescope and microscope expanded the range of vision reaching far into the heavens and into the microscopic world. The vacuum pump initiated the physics and chemistry of air and recreated the concept of atom of ancient Greek philosopher.

Towards the end of the 17th Century, the New Science was thus developed. Heaven and Earth are united in one physical body. Stillness and movement are understood comprehensively as a dynamic state. Mathematics played an important role in solidifying the basis of Natural Science.

The idea of universality of the Truth of Nature was emphasized and a new concept of confrontation between Man and Nature was fostered.

At that time, the end of 17th Century, three major propositions were presented for the future of Natural Science. Those three propositions have become the three stairs of the further development of Natural Science through the 20th Century.

The three propositions are the following:

1. ***The nature of light:*** The question whether light consists of speeding particles, or, it is a bundle of propagating waves, has been the leading theme in physics until the beginning of this century, these contradictory pictures of light were finally comprehended to the birth of contemporary physics;
2. ***The structure of matter:*** Towards the end of 18th Century, the modern chemistry finally gave the “due freeing from the struggle of Alchemy. The foundation of chemistry established at the end of 18th Century opened the door to the general understanding of the structure of matter and in the middle of 19th Century the chemistry of non-living matters (inorganic) and that of living matters (organic) began to be united;
3. ***The mystery of life:*** The origin of the vital power of living things and the vast diversity of creatures in Nature have been ultimate wonders.

In the beginning of the 19th Century, Johann Wolfgang von Goethe wrote in his book “Morphology”:

“When we study Nature, the more we study, we reach deeper admiration and respect for Nature. Most astonishing is the diversity in Nature and the ever intricate inter-relations among the vast diversity”.

A new concept of Molecule has developed towards the end of 19th Century. Giant molecules were conceived through the development of physico-chemical observations. The science of macromolecule was established during the first half of this century, soon macromolecules related to life, such as protein and DNA were intensively investigated. X-Ray, discovered by William Konrad Röntgen at the end of last century, provided powerful means to investigate structures of macromolecules. Physicists and chemists were attracted to the mystery of life and a new trans-disciplinary investigations are evolved with biologists.

One of the pioneers of molecular biology, Erwin Chargaff as a chemist expressed his feeling of attractiveness of biology as “its darkness surrounded by the brightness of the givennes of nature, the holiness of life”.

The human endeavor to seek the truth of nature has thus established the present state of natural science through specialization and integration for 300 years.

During the 18th century, the knowledge of natural science began to initiate innovations in technology, leading into the industrial revolution in the following 19th century. Industrialization soon became the measure of the modernization of nations. Rapid changes of social structure and pattern of living accelerated the shift of the sense of value of people in

society. Culture of war was encouraged, the development of devastating nuclear weapons, and we are now at the critical point whether we can create the Culture of Peace or is there no hope left for the future of humankind.

“Every science is the Science of Humankind”, are the words of James Clark Maxwell, when he started his lecture in Cambridge in 1871. In spite of the continued efforts of re-integrating branches of science in order to attain the wholeness of human wisdom, the education systems and research organizations have continued progressively the tendency of specialization and fragmentation seeking for more efficient pursuit, thus, increasing the gaps of communication among disciplines,

Integration of disciplines in education, for instance on Environment, is not just the aggregation and rearrangement of fragmented knowledge, but the establishment of philosophy for the real meaning of the advanced quality of life. We must emphasize again the freedom of thinking to create the consorted efforts of human for the future. Teacher and pupil relationship in the traditional sense should be altered to the new relation of communication between successive generations for the creation of our future.

As for the title ‘Universality and Diversity’, these are not really two ideas, it is not ‘Universality versus Diversity’. Every portion of human knowledge contains all of the other portions, either visibly or invisibly. I feel this is true for all culture of humanbeing, not just the natural science which I have very briefly reviewed.

We must appreciate and respect the Diversity in the world, but it is most important to realize the Universality underlying the whole range of the vast Diversity.

In the course of rapid change and so-called development, we left many things unfinished and neglected for a later time. Now we must gather those precious, invaluable wisdom. It is the mission of UNESCO for the future.

DEVELOPMENT OF PANRHYTHMISM CULTURE AND ENVIRONMENT

by Yûrijô Nakamura

Introduction

The organizers of the international symposium on 'Science and Culture: A Common Path for the Future' have suggested five sub-themes for our consideration: 'Quantum vision humanity'; 'Techno-culture of tomorrow' and 'Culture of Peace'. I have chosen to take up the second of these. For some years now the focus of my investigations as a philosopher has been 'panrhythmism'(1). So if I am to consider the future of science and culture, the problem of 'Culture and environment' is closest to my own concerns. In this 'paper I should like to go into the subject by replying, point by point, to the questions I have asked myself, in order to bring out the essentials of 'panrhythmism' and to present my ideas. Here, in brief, are the five questions.

- I. What, broadly speaking, is 'panrhythmism' and how did I come to conceive of this idea? Here I shall be dealing with the main lines of 'panrhythmism' and the reasons for my interest in the subject
- II. Why do the cosmos and the world of Nature give us such a strong feeling of life and why do they give birth to living beings when they are themselves composed of material elements? What mechanism is at work here?
- III. Rhythm is characterized by its remote action on things it does not touch directly through 'resonance' and 'pull'. What problems emerge if we look more deeply into this effect of rhythm?
- IV. How does the effect of rhythm relate to the latest advances in science and to such activities of the human mind as religion and the arts? To what knowledge does this lead and how are we to establish a link between these two facets of human culture?
- V. What particular aspects should we focus on in Japanese social and cultural problems and in international and racial problems when we study them in the light of 'panrhythmism' ? And in this perspective where does our responsibility as human beings lie in relation to the world environment'?

(1) The author presented a paper entitled 'place and rhythmic oscillation' at the UNESCO symposium held in Vancouver in 1989. 'Development of panrhythmism' was written as a sequel to that paper.

I

To outline what, I mean by ‘panrhythmism’, I shall begin with a sentence from an eminent poet. Octavio Paz maintains that everything we know as culture is based on ‘rhythm’, he says, ‘is not measure: it is a vision of the world. Calendars, morality, politics, technology, arts and philosophies, in short everything we call culture, is rooted in rhythm’.

True poet that he is, Paz intuitively grasped the effects of rhythm which are all-pervasive in many different areas. For a long time this sentence was my ‘Ariane’s thread’ when studying rhythm. Later on, I discovered a play on words by Hans von Bülow, a famous pianist and conductor of the latter half of the nineteenth century. He replaced the familiar opening words of the Gospel according to St John ‘In the beginning was the word’ by ‘In the beginning was rhythm’. In so doing he most appositely expressed the very nature of rhythm.

As is well known, Goethe had already written ‘In the beginning was the force’ instead of ‘In the beginning was the word’ in the prologue to *Faust*. I had long thought that this was a genuinely new idea worthy of the writer. But in the matter of word substitution it has to be acknowledged that the prize goes to the musician von Bülow. A good ten years went by between the time when I first encountered Paz’s words and those of von Bülow. In the interval I realized the full significance of the part played by rhythm in fields of the cutting edge of science, such as contemporary physics, cosmology and biology(2). More of this later.

I was also greatly inspired by the works of Hans Jenney (d. 1972), an eminent Swiss scholar who made a special study of vibration. A detailed presentation of his work appeared in the UNESCO *Courier* of December 1969. In a series of experiments Jenney demonstrated a remarkable phenomenon. Virtually all the shapes characteristic of the natural world, including both the animal and vegetable kingdoms, emerge before our eyes when a drop of mercury, quartz sand or lycopodium spore powder is subjected to vibration. The images I saw in a documentary made by Jenney produced a lively and unforgettable impression on me.

I should add that while I take a keen interest in areas outside the scope of ordinary scientific findings, I had reservations about the trend known as ‘New-age-science’ that swept the world in the 1970s and 80. Despite this attitude, sufficient facts and proofs are available to convince me of the power and role of rhythm and oscillation.

(2) cf. Y. Nakamura, *Place, topos and field*, 1989, Kôbundô, Chapters 2 and 3. This work is contained in the tenth volume of *Works of Y. Nakamura*, 1993, Iwanami-shoten.

I shall now turn to the question: ‘Why do the cosmos and the world of Nature give us such a strong feeling of life and why do they give birth to living beings when they are themselves composed of material elements? What mechanism is at work here?’

To answer these questions I shall begin by expounding the hypothesis, based on a wide range of evidence and ideas, that the origin of meaning and life in the cosmos lies in ‘rhythmic oscillation’. This hypothesis will be the starting-point for my investigations and speculations. And here I turn to the subject of the ‘celestial music’ echoing throughout the cosmos.

In Europe in the seventeenth century Blaise Pascal wrote in his *Pensées*: ‘The eternal silence of these infinite spaces terrifies me’. In this phrase he was expressing the fear that people felt when Galileo and Descartes ushered in modern science, causing the cosmos to change from an organic whole to an infinite homogeneous space. From antiquity, the cosmos had been regarded by scholars as a space filled with ‘celestial music’ or ‘celestial harmonies’. Pythagoras (six century BC), Ptolemy (third century BC) and Johannes Kepler (early seventeenth century) all used these images. Ptolemy wrote a book entitled *Harmonia* about the cosmos; Kepler was the author of a five-volume work on the planets called *Harmonices Mundi*. In the nineteenth century, Goethe, who was also a great student of Nature, described the heavenly bodies in this majestic passage from the prologue to *Faust*:

*‘The sun’s majestic song competes
In consort with his brother spheres,
His thunderous chariot completes
A progress destined through all years.
His light renews the angels’ strength
Though none may penetrate its ray,
And heaven’s high unfathomed length
Shines bright as on creation’s day, ‘*

‘Celestial music’ and ‘celestial harmony’ were long understood merely in the poetical, or at most metaphorical, sense. But we know, thanks to the invention and development of the radiotelescope, that the universe is indeed full of sounds and rhythms. The radiotelescope enables us to hear the electromagnetic waves emitted by the nine planets of our solar system (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto) by converting the waves into sounds and rhythms(3). I should point out in passing that the ‘celestial music’ picked up by radiotelescope resembles the sound a foetus hears in its mother’s womb. I noticed this resemblance when I happened to listen to the two sounds in succession(4),

(3) Cf. J-E. Berent, *Nada BRAHMA: The World is sound*, 1988, East-West Publication (original German edition, Insel Verlag, 1983), Chapter 4, ‘Before we make music, the music makes us’.

(4) Cf. Y. Nakamura, *The Odyssey of form: eidos, Morphens and rhythm*, 1991, Iwanami-shoten, Chapter 2, ‘Resonance exists everywhere in the six elements’.

If we grant that the cosmos and the world of Nature are full of sounds and rhythms, what mechanism is at work? My conclusion is that the most fundamental movement in the cosmos is none other than a phenomenon characteristic of 'non-linear systems with feedback'. Let me explain in more detail. Why would a non-linear feedback system produce rhythmic oscillation? The reason is that a given amount of energy, acting as a trigger mechanism, constantly flows from the outside into a system equipped with a self-regulating device for controlling the flow of energy. This movement can be replicated by constructing a simple model in which a valve regulates the volume of water flowing into a series of compartments.

If the system is a living organism, we can identify the various enzymes controlling the physical metabolism and introducing energy from the outside, the organism regulates the progress of the chemical reactions, keeping it at a fixed level. In this way the constant flow of energy brought about by various means in a non-linear system produces rhythmic oscillation. (We now know from quantum field theory that a quantum field consists of oscillations which repeatedly cause particles to appear and disappear. I shall return to this later).

3

No resonance or harmony such as 'celestial music', however, is produced by a single isolated rhythmic oscillation. Here we have to turn to the third question, namely: 'Rhythm is characterized by its remote action on thing it does not touch directly through resonance and pull. What problems emerge if we look more deeply into this effect of rhythm'?',

In the Netherlands in the seventeenth century Christian Huggens discovered that two pendulum clocks suspended from a beam will gradually synchronize and swing in unison. When this happens, both the frequency and the phase are synchronized. This resonance produced by rhythmic oscillation and pull is a remarkably pervasive phenomenon, to be found throughout the universe or Nature. As noted by Norbert Wiener, the mutual resonance of dynamos or of the brain waves produced by brain cells is a further illustration of this phenomenon, which is also to be seen in the beat of an animal's myocardial cells and in the harmony between a woman's menstrual cycle and the ebb and flow of the tide.

At some remote locations in the universe or Nature, this pull causes various non-linear oscillations to synchronize and resonate. There are innumerable such rhythmic pulls in the universe; indeed, in a sense they are the universe. One of the most fundamental is the way the circadian rhythm of each biological clock is pulled into the rhythm of the Earth's rotation on its axis. In other words, the circadian rhythm of each internal clock, of a cycle of approximately 23 1/2 hours, becomes part of the cosmic rhythm through synchronization and resonance with the rhythm of the Earth's rotation.

‘Celestial harmony’ is thus created in the following manner: First, a number of single isolated rhythmic oscillations are produced in Nature, some of which become increasing y independent. Next, the pull they exert on one another makes them resonate. Finally, the overlapping and growing complexity of these resonating rhythmic oscillations produces polyphonic ‘celestial harmony’. I believe that the genesis of living beings and their development as complex organisms are a product of this gradual process of rhythmic oscillation.

4

I now turn to the fourth question: ‘How does the effect of rhythm relate to the latest advances in science and to such activities of the human mind as religion and the arts? To what knowledge does this lead and how are we to establish a link between these two facets of human culture?’

In accordance with modern science, quantum theory has shown that the ultimate reality of matter resides in the sum of oscillating quantum fields. But what does it mean to say that material reality consists of fields? It is common knowledge that quantum field theory was first expounded about 50 years ago. Its concrete application is called quantum electrodynamics and it radically challenges the classical concept of matter. In other words, the formulation of quantum field theory has led to a fundamental change in the concept of the particle at the atomic level. Particles are no longer independent; what matters is the way in which particles change in the course of various interactions. Quantum theory has succeeded in describing particle interaction in terms of the concept of field.

But if material reality is a field, what is it filled with? The proposition ‘Nature abhors a vacuum’ of the old physics was refuted by Newton’s concept of absolute space, which confirmed the existence of the vacuum. But a new concept of the vacuum, or rather a new negation of the vacuum, was introduced with the formulation of quantum field theory in the 1930s and 40s. It became accepted that the so-called vacuum is never a mere void, but on the contrary that it teems with matter.

We now know that the vacuum previously regarded as emptiness consists of particles and antiparticles which repeatedly appear and disappear spontaneously. Why does space seem to us to be empty? Is it because quanta appear and disappear almost instantaneously and at very short intervals? A quantum is in a virtual state until it has sufficient energy to become real. More accurately, a virtual quantum consists of a virtual particle and its antiparticle. This pair of particles can easily be created from a vacuum because it has so little mass. A vacuum is therefore full of ‘oscillations’ which produce all possible quanta.

Let us now take a look at art and religion. Many artists and philosophers have discovered, in their own way, that rhythm can be the key to the secret of reality. At the beginning of the paper I already quoted the words of Octavio Paz: ‘Rhythm is not a measure: it is a vision of the world. Calendars, morality, politics, technology, arts and philosophies, in short everything we call culture, is rooted in rhythm’. He then adds that ‘Rhythm is the primary cause of creation. Binary or tertiary, antagonistic or cyclical, rhythm nourishes institutions, beliefs, arts and philosophies. History itself is rhythm’.

John Dewey noted that rhythm has the effect of binding science and art together by setting them on a universal foundation. In *Art as Experience* he says: ‘A common interest in rhythm still the tie which holds science and art in kinship’. He then goes on to say: ‘Because rhythm is a universal scheme of existence, underlying all realization of order in change, it pervades all the arts, literary, musical, plastic and architectural, as well as the dance... Underneath the rhythm of every art and of every work of art there lies, as a substratum in the depths of the subconsciousness, the basic pattern of the relation of the live creature to his environment’.

As I have already pointed out, the idea that rhythm is the underlying mode of reality is best expressed by Von Bülow’s phrase ‘In the beginning was rhythm’. But a more advanced conception emerges on a religious plane in the esoteric Buddhism of the Mantra (Shingon-Mikkyô), notably in the words of the monk Kûkai, the founder of this Japanese sect: ‘Resonance exists everywhere in the five elements’. Let us examine this notion more closely by tracing Mantraism back to its source.

From its very beginnings the doctrine of esoteric Buddhism was closely linked with oscillation. According to Tantrism, from which esoteric Buddhism derived, ‘The universe has been developing, it is said, since the first utterance of the monosyllabic mantra OM (esoteric verb). All that we see and hear in the universe is sounds condensed in a variety of ways from oscillations’. (Ajit Mookerjee, *The Tantric World*, 1980). Esoteric Buddhism is famed throughout the world as the religion that gave birth to the mandala, that marvelous religious design. The mandala is generally taken to be a symbolic representation of the universe composed of complex configurations of many Buddhas and Bodhisattvas. But to have a truly cosmic nature the mandala would have to be expressed in rhythmic sound. The words of the monk Kukai quoted above are therefore of great importance.

Kûkai briefly explains the essence of his doctrine in his linguistic work *Shôji-jissô-gi*: ‘Resonance exists everywhere in the five elements; all worlds have their own language; all the objects I know in the universe are letters; truth is to be found in things as they are’. Voice is of the essence; resonance exists from the moment the winds from outside and inside begin to stir; he calls this ‘voice’. Thus voice refers not only to the human voice but to everything that resounds when the five elements come into contact.

According to Kūkai, ordinary Buddhism consider-s the five elements (earth, water, fire, wind and sky) merely as material elements, whereas esoteric Buddhism not only ascribes sky (vacuum) directly to Dainichi Buddha, but regards all these elements as the symbolic expression of this Buddha himself. In other words, the five elements (earth, water, fire, wind and sky), when regarded as rhythmically resonating or vibrating, are the ultimate expression of the living world. And this is not all. By adding a further element, 'knowledge', to the five material elements, Kūkai reaches 'six elements'. By knowledge he does not mean mere learning, but all the modes of consciousness ranging from the five senses to the deepest level of the unconscious. So he might well have said: 'Resonance exists everywhere in the six elements' - a far more pointed formulation.

It will be clear by now, from what I have already said, that basically the effect of rhythm is to link two sets of things existing at different levels by passing through them. I here refer to such pairs as the material and the spiritual, the real and the symbolic metonymy and metaphor, fact and meaning, space and time, the means of linking them being the 'field', an essential condition, and the rhythm effect itself.

In its pure form, this essential condition the 'field' may be called the 'place of nothingness' to use the terminology of the Japanese philosopher Kitarō Nishida. This place, as I see it, is none other than the potential dynamic system that produces infinite being and meaning. In other words it reveals," both symbolically and in reality, the original state of the cosmos. In this sense, field in its pure form will be seen to be an essential condition both for science and for art and religion. It is somewhat complicated to show exactly why rhythm has the effect of linking these two forms of human culture by passing through them. For the time being, suffice it to say that in essence rhythm constitutes the purest form of 'information' generated by the ordered movement of things.

Finally I shall tackle the fifth question which is directly concerned with the subject of this symposium: 'What particular aspects should we focus on in Japanese social and cultural problems and in international and racial problems when we study them in the light of 'panrhythmism' ? And in this perspective where does our responsibility as human beings lie in relation to the world environment?'

The outstanding feature of contemporary society is that the rhythm of our daily lives has been seriously distorted and disrupted by a series of drastic changes, chief among them the rapid pace of industrialization. As a result human beings have lost both their inner sense of rhythm and the basic ability to communicate through rhythm. We acquire and assimilated this inner sense of rhythm a long time ago, almost without conscious effort, thanks to contact with Nature and the universe. It is common in every age for social change to disturb the rhythm of life, but there is no precedent throughout human history for such far-reaching and rapid changes as those taking place today.

Technological] civilization has dominated modern society all over the world, bringing a slew of novel difficulties in its wake, such as over-hasty industrialization, development detrimental to Nature, inertia in everyday life, erosion of family values, ossification of the education system, disorder in the practice of medicine and the spread of mental diseases. This state of affairs inevitably gives rise to rhythmic dissonance in all areas. It might even be said that our current problems are the result of a common rhythmic dissonance. Most people are vaguely aware of this situation, but fail to perceive it clearly because rhythmic dissonance is not something we can see with our own eyes,

For this very reason dissonance may be plunging its roots ever deeper into our civilization. Octavio Paz said 'Everything we call culture is rooted in rhythm', but the most fundamental of all is the vital rhythm. It is the very function of culture to protect, order and enhance the natural rhythm of life. So the disorders referred to above, namely over-hasty industrialization, development detrimental to Nature, inertia in every erosion of family values, ossification of the education system, disorder in the practice of medicine and the spread of mental diseases are all typically anti-life.

The first two, for example - over-hasty industrialization and development detrimental to Nature - take the form of a disruption of the ecosystem, in other words the vital rhythm. The next three - inertia in everyday life, erosion of family values and ossification of the education system - reflect a decline and loss of vitality in the substance of bodily and spiritual life, i.e. the vital rhythm. The last two - disorder in the practice of medicine and the spread of mental diseases - are obvious symptoms of anti-life forces in a situation where we have to defend ourselves against threats to life and to the vital rhythm if we are to enjoy peace of mind. While there is no instant remedy for this critical state of affairs, we cannot afford not to do something about it. At the very least we should try to re-establish contact with the vital rhythms hidden in every place and at every level, and to strengthen them. It is no easy task because many unmoving realities or 'invisible institutions' stand in the way. They must be eliminated as a matter of urgency.

In our examination of international and racial problems we have seen that 'culture' sometimes operates negatively. So far all the emphasis has been on its useful functions in enhancing friendship among peoples through 'cultural exchanges' or 'mutual understanding'. This is the problem known as 'cultural negativity', i.e. the fact that when the cultures specific to different races or nations come into contact they do not give rise to mutual respect and esteem, but on the contrary bring out violent opposition between the countries or races concerned. Religion is often the bedrock of a culture. Racial conflicts are proliferating in various parts of the world and are difficult to resolve because they are linked to religious problems. The United Nations has declared 1995 the 'Year for Tolerance' and is actively mounting a series of campaigns, no doubt because a 'spirit of tolerance' is now perceived to be essential. Humanists like Erasmus advocated this spirit at the time of the Wars of Religion in the sixteenth century.

Tolerance is usually defined as ‘recognition of the opinions and rights of those who practise a faith other than one’s own’. This is not easy, perhaps because such recognition or understanding, which is often little more than a fleeting and superficial gesture, does not match the rhythm of the culture or the religion concerned. When this rhythm is taken in the wrong way, difficulties are accentuated. And when the advanced countries with their modern life-style impose their culture on foreign countries or peoples in the guise of civilization, they provoke a deep-seated loathing, partly because they are imposing the rhythm of their own culture.

Finally I asked: ‘In this perspective where does our responsibility as human beings lie in relation to the world environment?’ This too is a vexed question, and for the moment I shall confine myself to the following three points. We can begin with the idea once expressed by José Ortega y Gasset that ‘The self consists of the self and the environment. If I fail to save my environment, I fail to save myself’. At first sight these words seem egocentric and beside the point. But if we propose a scheme that is too perfect or make a declaration that is too positive and lacks the personal or human touch, it becomes a mere pipe-dream and we are acting irresponsibly.

.I.

The meaning of the phrase ‘The self consists of the self and the environment’ is that the environment is to be viewed as a part of oneself while the self is to be viewed as a part of the environment. As we all “now know, a properly functioning ecosystem is the prerequisite of human existence; a properly functioning ecosystem means one that maintains the vital rhythm established by metabolism. Rhythmic dissonance in the natural environment alerts us to a deep disturbance in the ecosystem. Dissonance in the rhythm of the natural environment is readily perceptible by human beings because of the nature of the rhythm and the relationship between ‘the self and the environment’. We must learn how to eliminate the destructive agents in the ecosystem around us.

Secondly, we must review our knowledge or awareness of ‘our planet’. This has two aspects. The first relates to the distortion arising from the fact that in astronomy the Copernican revolution has shifted the Earth from the center of the universe, while the ego symbolized by the ‘cogito’ of Descartes has taken up position at the centre of the human world. We have to confront this distortion and correct it, which means that we must extend the notion of ‘environment’ as it appears in the expression ‘the self consists of the self and the environment’ cited above to include the planet as a whole.

The second aspect relates to the clear knowledge of the Earth’s non-linearity. On this subject Dr. D. McLaren, President of the Royal Society of Canada, has some interesting things to say at the symposium held in Vancouver in 1989. According to him, the Earth is ‘a small planet in space that is inherently changeable’ and a dynamic system enclosing complex subsystems. Since the Earth, as part of the solar system, is subject to radiation from space, it is beyond our capacity ‘to predict future changes accurately’ by scientific means. This acknowledgement of the Earth’s non-linearity goes hand-in-hand with the notion that the Earth is a field of rhythmic resonance, which should be a lesson in modesty for us all, laymen and scientists alike.

My third point concerns the status and purpose of human beings on Earth and in the universe. My reflections on this subject are based on an idea of Pierre Teilhard de Chardin, a paleontologist and a Catholic priest. He believed that human consciousness had been formed in the course of a majestic evolution towards the 'noösphere' by way of the 'geosphere', consisting of the spheres of gravity and the atmosphere, and the 'biosphere'. Thus human consciousness was the point of convergence of an increasingly complex universe and the product of its creative integration.

To tell the truth, I cannot altogether go along with Teilhard de Chardin's loftly vision of the universe. But his idea that 'Life emerges from matter and spirit emerges from life' is in line with my 'panrhythmism'. I do not necessarily regard human consciousness as the 'point of convergence of the universe', as Teilhard does. Nevertheless, the life or death of the Earth is today in the hands of the technological civilisation generated by human consciousness. Could we not therefore ground humanity's responsibility for our planet in Teilhard de Chardin's concept of consciousness?

UNESCO AND INFORMATION TECHNOLOGY

by Takuma Yamamoto

Preface

Today, I would like to address my speech under the title of UNESCO and Information Technology.

UNESCO, once full of radiance and vitality, is not just the same after fifty long years.

I would like to discuss with all of you here today whether or not we can attempt to increase efficiency and activation by way of installing the new Information Technology in UNESCO activities.

First, I would like to delineate the advancement of information technology. Then I will discuss how we can apply these technological marvels to further broaden UNESCO activities effectively.

Development of Information Communication Technology and GII (Global Information Infrastructure) Initiative

We, in the industrial nations, are now witnessing the advent of multimedia age. Or, we now stand on the threshold of the new era of full-fledged information society.

This has been brought about by the technological breakthroughs in semiconductors, light communication, and so on.

1. Thirty five years ago, a single transistor cost about 1,000 yen. Today, an IC mounting 4 million transistors is also priced at about 1,000 yen. Running a simple equation, the price of a transistor nose-dived to one four millionth. The information processing capability per cost has improved exponentially. This achievement renders it possible to develop a large-scale operating system that parallels in its capacity with a mainframe, allowing hundreds of households to be outfitted with reasonably-priced personal computers.

2. The development of light communication has enabled voluminous amount of data and images to be transmitted at high-speed.

As the communications system is increasingly switching from analog to digital, information can be easily processed, converted, or reused.

Communications that once could be one-way street is getting more and more interactive. As Video-On-Demand (VOD) or electronic commerce through which business transactions can be made electronically becomes everyday norm, the way of our life and business will take on a new dimension of unprecedented proportion.

The information is getting ever more globalized than before. We will surely live in a wired world in the web of networks.

One such prominent example is the GII initiative that is well under way. The GII initiative is first advocated in March 1994 by the U.S. Vice President Al Gore. Based on the vision called National Information Infrastructure Mr Gore had put forward, the GII initiative entertains the idea of expanding the sophisticated communication networks on the global scale.

On the private front, the GII Commission was established in February 1995 to actively support the globalization of information. I attended its first general assembly held last July,

Executives representing the blue-chip companies dealing in communications business participate in the GII Commission from many countries. There are some groups, each of which takes up GII from various aspects and makes proposals to the governmental agencies.

It goes without saying that the scope of our activities covers beyond the boundaries of industrial countries. It aims at the entire world as the target.

3. The Expansion of UNESCO Activities by Means Of Information Technology:

- With the application of information technologies I have just mentioned. I believe we can deepen and reinvigorate our activities at UNESCO;

- The National Federation of UNESCO Association of Japan is promoting unique and concrete international co-action movements such as the World Co-Action Terakoya Movement and the business related to the Convention of World Assets as well as various other UNESCO activities in collaboration with local UNESCO associations;

- Now I would like to enlarge upon some of my ideas on how to develop UNESCO activities by utilizing the information technologies:

(1) Use of Telecommunications Network or Internet

First of all, I suggest the unitalization of telecommunications networks including the Internet;

Telecommunications network is expanding rapidly. The number of individuals and companies that log on to the networking system is proliferating. The number of enrollees of one personal computer company with which I am involved well exceeds one million, with 50 thousand new corners joining in month after month;

. The Internet, which links networks, is making a worldwide onslaught. The number of its users has been on a steady rise and it is estimated that scores of millions of people are surfing on the Internet around the world;

Telephones can be described as a communication of luxury, because it requires two parties at the both ends of the line at the same time to convey ideas. In contrast, telecommunications is only a keystroke away. Data can be sent even when the other party is not available at a particular time. In this sense, it might as well be said that telecommunication is a more basic means of communication than a telephone;

. Moreover, telecommunications can offer the users with far larger advantages in that a) it can send information to a plurality of people instantaneously, b) receivers can save an file the information, and c) the information can be converted into other media, and so on;

. Information exchange or collection by means of telecommunications including the Internet will become the part and parcel of global activities in the future;

. The GII Commission, which I have mentioned before, has decided to conduct all meetings via Internet;

. It is of vital importance that we vigorously adopt the technologies to facilitate UNESCO activities;

. Via E-mail, we can simultaneously and instantaneously exchange and transmit information to the UNESCO associations and clubs all around the globe;

. The use of E-mail will allow us to communicate with overseas donors faster than mail and cheaper than international telephone calls;

For instance, if we secure an electronic conference room designated for UNESCO, we can carry an electronic conference not just among the UNESCO members, but by inviting average people to participate in it. This would enable us to obtain wide range of opinions and information from the people at grassroots levels, which can be reflected upon the UNESCO activities;

By making the most of global networks, we can exchange our views and feedback so as to vivify activities ever than before.

(2) Use of Telecommunications for World Co-Action Terakoya Movement

Secondly, the technological advance will be adopted for the purpose of extensive education:

Information technology is bringing about a sweeping change into the field of education:

North Carolina in the United States has set a prime example of adopting the remote education using the information highway;

It was launched by NYNEX, the leading family of communications companies in the United States. Fujitsu provides the ATM switching system, the core of the information highway;

. The state government of North Carolina embarked upon remote education in August 1994, linking multiple of state schools by information superhighway;

. Making the best of the leading technology, universities setup branch schools in the state, Students who would have had to drive long distance of 100 miles or more to attend classes now need to go only a few miles;

As a result, the stress on the students were unloaded, and regional discrepancies within the state was largely rectified;

. Of course it takes years before we can introduce remote education as efficient as in the case of North Carolina to the developing countries, but it is viable to avail information superhighway commensurate with the stages of development of each country;

. UNESCO is making efforts to address the issue of illiteracy. As part of its commitment, the National Federation of UNESCO Associations in Japan is staging a campaign called the World Co-Action Terakoya Movement;

It is the movement that supports and provides private groups tackling to overcome the illiteracy in the developing countries with funds with which to build learning facilities (Terakiya), to buy textbooks, stationery equipment, and other furniture. NFUAJ has assisted 249 literacy projects carried out by 118 groups in 42 countries and one region.

The word Terakoya has its origin in the private educational institutions developed in Edo period for children of the commonality. Terakoyas that dotted across the landscape laid the foundation for basic education and paved the way for the social infrastructure that later became the engine toward the modernization of the country. Thus it is our earnest desire that the World Terakoya Movement will serve the purpose of eradicating illiteracy from the world;

. In most part of the world, education means first to build a school. Then, children are gathered to receive education. However, there are many children in the world who live miles away from the school;

. If, for example, a TV set is provided for the household of a village chief, and children get together in the house, it is possible to give literacy education to them by sending radio waves to the houses of village chiefs from the radio station;

. Although this may sound unattainable in the near future, but once children acquire the basic knowledge, and the infrastructure has improved, higher education can be given to children through remote education. Then, they can be enlightened up to par with the children in developed nations using the latest materials and textbooks. It is also possible that they can join in research and development projects with overseas educational bodies and research centers;

. The use of broadcast schooling or remote education will reduce the regional discrepancies in education, producing a fruitful outcome in the betterment of the developing countries.

(3) Use of Telecommunications to the World Heritage Movement

. Thirdly, the telecommunications technology can be applied for the protection of world heritage;

. The World Heritage Convention was ratified at the 1972 UNESCO General Conference. This convention is the pledge of the world to protect both the nature and cultures equally, regarding that they are their mutual complementaries;

Japan joined in the Convention in 1992, and the Shirakami Sanchi, the Buddhist Monuments in the Horyu-ji temple area, the Himeji-jo castle, the Yakushima and Historic Monuments of Ancient Kyoto are registered on the list of World Heritage sites;

. NFUAJ has been calling for better and deeper understanding toward the world heritage through various activities;

. We also support the campaigns for protecting the relics that give us insights into the ancient civilizations and the environments in which endangered species are taking their last sanctuaries, by raising funds to the World Heritage Fund which is managed by the UNESCO World Heritage Center. This is also our hope at UNESCO that our children will inherit the nature's endowment and cultural heritage our forefathers have bequeathed to us.

Now, I'd like to draw your attention to the concept of archives using the digital technology that can contribute to such activities, Two of the eminent proponents of this concept are Professor Ikuo Hirayama, the President of the Tokyo National University of Fine Arts and Music and Professor Yoshio Tsukio of the University of Tokyo.

With the digital images at hand, restoration and maintenance of World Heritage such as the Angkor Wat will be more easily perfected. The concept will be extended to include not just world-class properties but also national, regional, and to the level of municipal properties.

Its target will also be broadened to cover arts and cultural heritage and intangible cultural heritage in addition to the natural parks and historical buildings.

As the world, national, and municipal (including private assets) archives are linked via networks, users can tap into enormous records to glean any information, animation, pictures, three-dimensional images, music, documents, etc., at their terminals.

It is desirable that the archives be used as wide a purpose as possible, from the maintenance of restoration of cultural heritage to the research, education and appreciation of artworks.

Because the digital information does not degrade, optimum protection measures can be taken to the actual properties, by limiting their opening to public only for research and study purposes.

Networking the digital archives costs colossal amount of money. We must start with a practical step.

However, for instance, the Angkor Wat has been eroded. Its recording is an urgent task, but Cambodia is not awash in money. Under such circumstances, UNESCO can take measures to help Cambodia by raising funds and contributions from the world.

It is our earnest hope that such activities be actively promoted as they surely strike accord with the spirit of the World Heritage Convention and are suitable as cultural activities at regional UNESCO clubs and associations.

4. **At the closing of my speech**

As I have discussed so far, the technological advances in the telecommunication, remote education, or digital archives will be greatly conducive to the expansion of UNESCO activities.

I would like to make one note that, in the age of full-fledged information society, it is required each of us, individuals of organizations, to deal with the issues of our time with proactive mindset.

That is, we have to discriminate and send information that suits the purpose. It is vital for us to actively upskill our capacities so that we can be bestowed upon bountiful benefits of the marvel of the leading technologies.

The National Federation of UNESCO Associations in Japan is eager to make our utmost effort in the development of UNESCO activities, and is ready to assume a greater role in the shaping of a truly harmonious global village.

MINAKATA-MANDALA A PARADIGM CHANGE FOR THE FUTURE

by Kazuko Tsurumi

This is a story of a man, a pionner in Japanese folklore studies, micro-biologist, and the forerunner, in Japan, of ecological movements for conservation of forests, an unusual combination. His name is Minakata Kumagusu (1867-1941), whom Carmen Blacker designated 'a neglected Japanese genius', in her 1983 presidential address to the British Folklore Association (1). Indeed, he had long been neglected in Japan as well as in England, where he sejournd for eight years toward the end of the last century. It is only recently that we have come to witness a resurgence of Minakata studies in Japan.

Focus of my discussion will be: first, to explain his idea of Mandala as a model of scientific methodology; second, to point out how new and unique was his idea of scientific method, expressed in the form of Minakata-Mandala, in comparison to the basic concept of Newtonian mechanics, which was the predominant paradigm of the 19th century; third, to reflect upon some sources of his intellectual creativity, as revealed in Minakata-Mandala, with reference to his cultural background, and also to his life-long close observation of slime molds (Myxomycetes; Mycetozoa), which he considered to be the elementary form of life; and finally, to conjecture the implications of Minakata-Mandala for a paradigmatic change for the future.

1. What is Minakata-Mandala

Minakata was born in the city of Wakayama, in the southern part of the Japanese mainland, as a son of a wealthy merchant. His parents were not educated, but they were devout Buddhist believers of the Shingon sect. The Buddhist tales they told him in his childhood has a deep and sustained effect upon him, and he was well versed in the Buddhist scriptures. After finishing high school in his native town, he went to Tokyo to enter the Preparatory School, the predecessor of Tokyo Imperial University. After two years he quit the Preparatory School and left for the United States, where he stayed for three-and-a-half years. Then he left for London, where he sejournd for eight years. He was a self-educated man, who trained himself into a great scholar, without getting any university degree from anywhere. He learned several foreign languages, read, and made notes of books in those languages, on history, art, literature, ethnology, anthropology, sociology, psychology, philosophy, religion, biology, geography, etc., at first mainly at the British Museum, and later at the Natural History Museum, and Southern Kensington Museum of Art.

(1) Carmen Blacker, 'Minakata Kumagusu: A Neglected Japanese Genius', *Folklore*, (The Organ of the British Folklore Association), 1983.

Minakata began writing for the journal *Nature* in October 1883. His first article, 'The Constellation of the Far East', brought him sudden fame. Later, he began contributing articles to *Notes and Queries*. In *Nature*, he published fifty articles from 1893 to 1914, while he contributed 323 pieces to *Notes and Queries* from 1899 to 1933. The inaugural issue of *Notes and Queries* encouraged the spirit of polemic:

Notes relating to all subjects but such as are, in popular discourse termed either political or polemical, should meet in our columns in such juxtaposition, as to give fair play to any natural attraction or repulsion between them, and so that if there are any hooks and eyes among them, they may catch each other (2).

It was in this spirit of dialogue that Minakata continued to write for the journal even after he came back from London, and settled down in Tanabe, a small town near his native city, Wakayama. According to the diary he kept while he was in London, he used to stop at Hyde Park, on his way from the British Museum, to listen to soap-box speakers, debating on atheism, a very popular and controversial subject of those days. These experiences seem to have contributed to Minakata's way of developing his own ideas through confrontation rather than acquiescence to authority.

In the winter of 1893, Minakata encountered Toky Horyu (1854-1922), a high priest of Shingon Buddhism, who happened to visit London on his way to Paris. Minakata and Toky began to correspond between London and Paris immediately after their first rendezvous, and their correspondence persisted long after both of them returned to Japan.

Minakata left London in 1900, and returned to his native city, Wakayama. He was expelled from the home of his younger brother, who had inherited their father's business, and was forced to live in seclusion, for two-and-a-half years at the remote place of Nachi, Kii, at the foot of the Kumano Mountains, which were covered with primeval forests. During the plants, such a slime molds, lichen, algae, etc.; and the evenings were spent in reading, writing and making specimens out of the plants collected. In his autobiography he wrote it was 'the life of extreme solitude' (3).

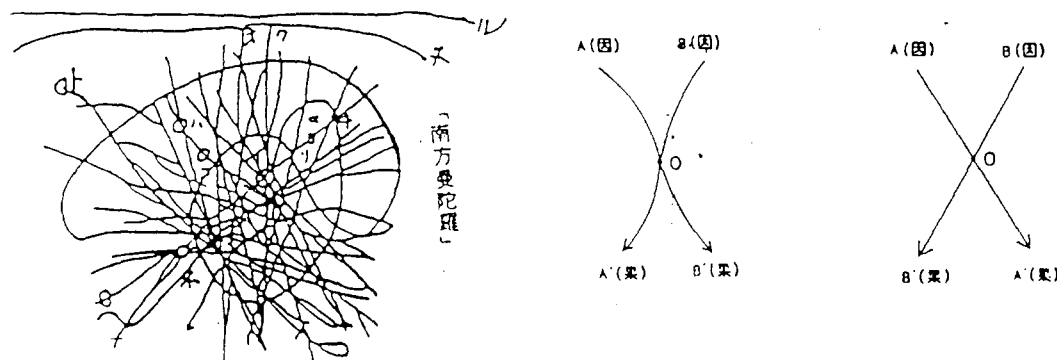
It was in his correspondence to Toki Horyu that Minakata gradually evolved his idea of 'Mandala as a miraculous method', beginning as early as in 1893, and culminating in his letters written from Nachi in 1903. In his letter of July 18, 1903, the picture, as shown in the diagram 1 (4), appeared, and its explanations were given in this and the following letters.

(2) *Notes and Queries*, October 14, 1899.

(3) Minakata Kumagusu, 'Rirekisho' (A Short History of My Life), *Minakata Kumugusu Zenshu* (Collected Works of Minakata Kumagusu), Vol.7, Heibonsha, 1971, p. 31.

(4) *Minakata Kumagusu/Toky Horyu Ofuku Shokan* (Correspondence between Minakata Kumagusu and Toki Horyu), edited by Iikura Shohei and Hasegawa Kozo, Yasaka Shobo, 1990, p. 308.

Diagram 1. 'Minakata-Mandala'



The term 'Minakata-Mandala', which we now give to this diagram, is not what Minakata himself called it. In 1978, when I was writing a book on Minakata (5), I happened to show this diagram to Dr. Nakamura Hajime, a most respected scholar on Buddhist philosophy. He instantly said 'Ah, this is Minakata-Mandala, is it not!' Thus, a prestigious name was given to this strange scribbled diagram, and it acquired a serious meaning: a new model of scientific method.

The law of causality was the major focus of 19th century science, to which Minakata was fully exposed while he was in England: and it was this theory that Minakata tried to challenge. In the 19th century it was accepted that causality meant that 'if there is a certain effect, there is of necessity a cause for it', and that 'the same cause of necessity gives rise to the same effect' (6). It was against the second proposition that Minakata raised his criticism he contended:

Today's science solves (or we might better say, it is expected to solve) the riddles of causality. It comprehends what Buddhism calls in (因), but not in (縁). It is my obligation to inquire into this matter. *En* is what emerges out of the inter-twining of one series of cause and effect with another. In order to grasp the total picture of the world, both cause and effect (*in*) and their interrelationship (*en*) should be understood (7).

(5) Tsurumi Kazuko, *Minakata Kumagusu: Chikyushiku no Hikakugaku* (Minakata Kumagusu: a Global-oriented Comparativist), *Nihon Minzoku Bunka Taikei* (Japanese Folklore Culture Series), Vol.4, Kodansha, 1978: Kodansha Gakugei Bunko (paperback edition), 1981.

(6) Yanase Mutsuo, *Butsurigaku no Shiso to Hoho* (Ideas and Methods of Physics), 1978, pp. 154-5.

(7) *Minakata Kumagusu/Toki Horyu Ofuku Shokan* (Correspondence between Minakata Kumagusu and Toki Horyu), op. cit., p. 335.

In this matter, Minakata maintains that the world view of Mahayana Buddhism is superior to that of modern science, since Buddhism talks about *in* and *en*, or *innen*. *In* stands for causality, while *en* stands for accidental encounters of different chains of causality. When one series of cause and effect is in the process of evolving, it may accidentally meet another series of cause and effect. Then the first, the second or both series of cause and effect might change its course or their courses from what it had been or they had been expected to follow, had it not been for the meeting (diagram 2). What Minakata tried to get at was the problem of relationship between necessity and chance.

Minakata reinterpreted the original Mandala, which illustrated the world view of Shingon Buddhism with the Dainich Buddha (Great Sun Buddha (Vainocana) in the center, and all other Bodhisattvas given their own proper places in their relation to Vainocana, as a scientific model to grasp the interrelationships of all the phenomena in the world, material and immaterial. Incomplete as his argument was, Minakata hit upon the crucial problem of logic and scientific method not only of his day but of today.

The second vital feature of Minakata-Mandala as a model of scientific method is Minakata's emphasis on 'sui-ten' (交汇点) which literally means converging point, or intersection. In Shingon mandala, consisting of the Matrix-mandala (Mahakarunagarbhadhava-mandala) and the Diamond-Mandala (Vajradhatu-mandala), Vainocana is right in the center of the universe; and not only that, but he is even identified as the universe itself. Minakata reinterpreted the idea of the center as the intersection or the point of convergence, where the greatest number of series of causes and effects meet. The most effective way of riddle solving, according to Minakata, is to try first to locate such a point of convergence, vis-à-vis the specific problem to which one addresses oneself, and then to proceed to study each chain of events which is relevant to the problem. Minakata-Mandala stands for a holistic approach to natural and human affairs.

Although Minakata never wrote any theoretical essay on Minakata-Mandala, except for his letters to his priest friend, he made full use of the method in his comparative study of folklores in the global context; in his search for and observation of slime molds; and in his ecological movements for the protection of forests (8).

2. Chance and Necessity at the Turn of the Century

Toward the end of the 19th century, predominant as the theory of necessity, based upon Newtonian mechanics, was in various fields of science, there emerged some new tides in the field of thermodynamics. James Clerk Maxwell (1831-79) and Ludwig Boltzman (1844-1906) presented a theory of movements of gaseous molecules, which contributed to the rise of statistical mechanics. This theory utilizes the concept of probability, which implies chance factors.

(8) For further discussion on Minakata-Mandala, see Tsurumi, *Minakata-Mandala Ron* (Essays on Minakata-Mandala), Yasaka Shobo, 1992.

It was not until the formation of quantum physics, from 1925 through the 1930s, by the consecutive efforts of physicists, like Niels Bohr (1885-1962), Werner Karl Heisenberg (1901 -76), Paul Adrian M. Dirac (1902-84), Johan Ludwig von Neuman (1903-57), Eugene Paul Wigner (1902-94) and others, that the methodological] importance of chance came to be clearly established.

In relation to this historical context of scientific evolution, Minakata's recognition of chance as an indispensable factor in scientific method is quite early. The American philosopher of science, Charles Sanders Pierce (1839-1914), published the essay, 'The Doctrine of Necessity Examined', in the *Monist*, in 1892, where he persuasively developed his idea of chance. As mentioned above, Minakata began to write about Mandala in 1893, in his letter to Toki Horyu. But his idea of chance in contrast to necessity was not clearly defined until the summer of 1903. In that matter, therefore, Pierce preceded Minakata. As far as I know, there is no evidence that Minakata read any of Pierce's writings, and vice versa. Pierce was a man of science, 'thoroughly grounded', as he describes himself, 'in physics, chemistry, mathematics, gravitation, optics, astronomy, etc'. He was 'a great student of logic' and of the history of philosophy. Despite, (or rather, owing to) his erudition and originality, he never acquired a position in a university. He was born and lived all through his life in Cambridge, Massachusetts. He was long neglected, as was Minakata, and it was almost twenty years after his death that the *Collected Papers of Charles Yanders Pierce* was published in six volumes by Harvard University Press (1931-35).

In his essay 'The Doctrine of Necessity Examined', he proposes 'to examine the common belief that every simple fact in the Universe is precisely determined by law'. He maintains that there is 'real chance' in nature which does not conform to the law of necessity, and that to see irregularities in nature is not due to human errors of knowing. 'Try to verify any law of nature, and you will find that the more precise your observations, the more certain they will be to show irregular departures from the law'. To demonstrate those propositions, he gives the Maxwell and Boltzman hypothesis that 'the particles of gases are moving about irregularly, substantially as if by real chance, and that by the principles of probabilities there must occasionally happen to be concentration of heat in the gases contrary to the second law of thermodynamics, and these concentrations, occurring in explosive mixtures, must sometimes have tremendous effects' (9).

Vastly different as Pierce and Minakata are, in their style of writing and in their approach to the problem of chance, there is an interesting parallelism between them. In those days, in contrast to London, the flowering center of scientific advancement, New England, where Pierce lived, was still on the periphery of the European learned society, while Nachi, Minakata's abode, was still further removed from civilization. Both of them were forerunners of a paradigmatic change in scientific method at the turn of the century, paradoxically enough, from the respective peripheries, independent y and far apart from each other. We might say that a new wind is likely to arise from the periphery.

(9) Charles S. Pierce: *Selected Writings (Values in a Universe of Chance)*, ed. with an Introduction and Notes by Philip P. Wiener, Dover Publications, 1958, pp. 170-171.

3. Sources of Creativity

Let me come back to Minakata Kumagusu, and reflect upon the sources of his intellectual creativity, as expressed in Minakata-Mandala.

First, it is my contention that Minakata-Mandala is the outcome of the process which Minakata went through in his mind, from 1893 through 1903, from confrontation to integration between two vastly different cultures, diverse in time and space. It was the conflict between ancient Mahayana Buddhism, which had originated in India, and the modern scientific way of thinking, which developed in 19th century England. Creativity is defined as ‘novel combinations or unusual associations of ideas’, under the condition that ‘such combinations must have social or theoretical value, (in case of science) or make an emotional impact on other people, (in case of art and literature)’ (10). Silvano Arieti specifies the elements that are to be combined in the creative process. He maintains that two sets of combinations are involved in the creative process: 1) that of the concept, clear and distinct, and *endocept*, vague principles of identity, contradiction and excluded middle, and *paleologic*, which disregards those principles, and tends to emphasize sameness rather than making distinctions (11).

What Arieti calls ‘endocept’ and ‘paleologic’ are predominant characteristics of the primary process of thinking in terms of an individual’s life cycle, as in childhood. They also refer to those of the primitive and archaic stages of societal history. In the latter sense, the combination of *endocepts* and Cartesian clear and distinct concepts, and that of *paleologic* and formal logic can be interpreted as the combination of ancient and modern patterns of thinking and doing things. In the case of late-comers like Japan, pre-modern patterns are mainly those endogenous to the society or exogenous patterns indigenized during the earlier stages of the people’s history, while many of the modern patterns are those introduced recently, mostly from Western European countries and the U.S.A.

I should like to distinguish at least two processes of combination: confrontational and fusionist. In the confrontational process, one emphasizes contrasts and makes clear distinctions between old and new ideas, native and foreign. Through confrontation and conflict, efforts are made to restructure one or both of the conflicting ideas so that there may emerge a new integrative perspective in thinking. The second is the fusionist process, in which one maximizes efforts to avoid confrontation among different ideas, and by trying to interfuse them together, one makes differing, and often conflictual ideas coexist within a system.

(10) P.E. Vernon ed., *Creativity*, Penguin Books, 1970, p. 12

(11) Silvano Arieti, *Creativity: A Magic Synthesis*, Basic Books, 1976, p. 62.

According to my observation, Minakata represents confrontational type of creativity, while Yanagita Kunio, another Japanese pioneer folklorist and Minakata's contemporary, stands for the fusionist type (12).

Second, Minakata's creativity derives from his life-long observation of slime molds in their living context in nature. According to 'A List of the Japanese Species of Mycetozoa' written by Minakata for *The Japanese Journal of Botany (Shokubutsu Zasshi)*, pp. 41-482. 1927), 196 species of slime molds are listed, out of which 99 species were discovered by him (13).

Out of all the slime molds he collected, the most distinguished was the one which he happened to discover in August, 1917, on the bark and lichen on the trunk of living persimmon tree, in his own garden in Tanabe. This specimen was to Gulielma Lister, the British expert on mycetozoa, who recognized this as not only a new species, but as a new genus, and gave the name, 'Minakatella longifila G. Lister'. This was reported by her in the *Journal of Botany* in 1921 (14).

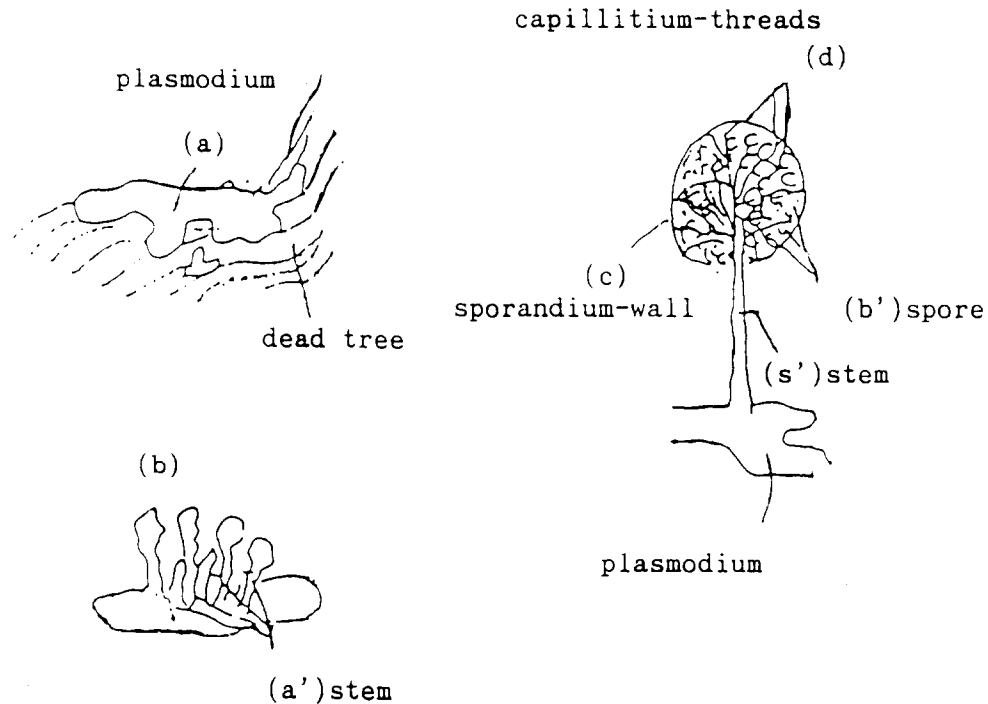
The following illustration (Diagram 3) was Minakata's own drawing to show the dynamic process of metamorphosis of slime molds, presented in his letter to Iwata Junichi (1900- 1945), a writer on the history and folklore of male homosexuality. Minakata tried to communicate to his friend, who had little knowledge of microbiology, why he was enthused with this curious living thing.

(12) For further explanation, see Tsurumi 'Forms of creativity in Japanese Technology', *Research Papers*, Series A-52, Institute of International Relations, Sophia University, 1988, pp. 3-10; Tsurumi, 'Creativity of the Japanese: Yanagita Kunio and Minakata Kumagusu' *Research Papers*, Series, A-39, 1980.

(13) Hirano Imao, *Daihakubutsu Gakusha: Minakata Kumagusu no Shogai* (A great Naturalist: The Life of Minakata Kumagusu), Riburoto, 1982, pp. 262-273.

(14) *Ibid*, , pp. 2516252.

Diagram 3. Minakata's Sketch of Slime Molds



(a) In the state of plasmodium, it makes amoeboid movement to prey mainly upon bacteria in the tree trunks and withering leaves; after a while, being affected by sunshine, heat, humidity and wind, it can no longer stay in that form;

(b) Out of the plasmodium, some of its particles turn into stems, some other particles climb up the stems to become spores, and at the same time;

(c) still other particles turn into sporangium-walls;

(d) capillitium-threads put stems, spores and walls together. When the wind happens to blow, the walls, stems, threads, and spores disappear, to return to the original state of plasmodium. The plasmodium, which men look down upon as a despicable phlegm-like object, is, in fact, most lively, while the handsome-looking object, is, in fact half-dead, only to protect spores for future propagation. It is an entirely false recognition of humans to judge the half-dead object as alive, while to consider as dead the plasmodium, the most active state of slime molds (15).

(15) *Minakata Kimagusu Zenshu* (Collected Works of Minakata Kumagusu), *op. cit.*, Vol. 9, pp. 28-29.

In 1926, when his disciple, Koaze Shim (1875-1951), presented the specimen of slime molds which he had collected, to the Emperor Showa while he was the Crown Prince, Minakata prepared an explanatory note. He stated that the slime mold is 'the primitive animal' (protozoa), to which Hattori Hirotam (1875-1965), the Chairman of the Imperial Research Institute of Biology, made a strong objection by contending that the slime molds were 'primitive living beings' (Protista). Minakata, quoting A. de Bary (1831-1888), insisted that the slime molds were protozoa, the elementary form of animals, not that of plants (16).

Despite the fact that the dichotomous taxonomy between animals and plants gives way to the classification of living beings into five categories, as in the case of R. H. Whittaker (1969), whether slime molds should be classified into fungi or animalia still remains problematic (17). According to Kamiya Noburo (1913), a distinguished molecular biologist who has done experimental research on the protoplasmic movements of slime molds, 'slime molds are endowed with in-between characteristics of animals and plants' (18).

What Minakata learned through his observation of slime molds is as follows: first there is a cyclical change of living and dead (or half-dead) states of living things; and the boundary between life and death is not clear and distinct, as it is usually thought to be. Mimi often makes erroneous judgements on the subject. The line of demarcation between life and death is now a controversial issue in relation to the transplantation of internal organs, Minakata's discussion on the slime molds is relevant to the present-day issue.

Second, the processes of change from the phlegm-like state into the fungus-like shape and vice versa depend much upon chance factors rather than upon necessary laws.

Third, Minakata was the first person in Japan who used the term 'ecology' to protest against environmental disruption. He observed that slime molds grew on the wet trunks of trees of at the bottom layer of the community of plants of diverse species and at different altitudes. Unless the whole structure of vegetation peculiar to a specific locale is maintained, slime molds alone cannot survive. Minakata understood ecology as the holistic structure in which soil, water, plants and animals of diverse species, including humans, lived in mutual interdependence and in a constant process of transformation and circulation (19).

(16) *Ibid.*, pp. 456-458

(17) Hagiwara Hiromitsu, 'Myxomycetes', Kobayashi Yoshio, et al., eds., *Minakata Kumagusu Kinshi: Fungal Enumeration by Kumagusu Minakata*, vol. 1, published by Minakata Fumie, 1987, p. 122.

(18) Kamiya Noburo, 'Shinseinenkin no Undo' (The Movements of Mycetoza), (The speech to commemorate the first Minakata Kumagusu Prize in natural science, in the city of Tanabe, April 22, 1991).

(19) See Tsurumi, '3. Minakata Kumagusu and His Ecological Movement' in 'Animism and Science', *Research Papers Series A-58, op. cit.*, 1992, pp. 6-8.

Fourth, Minakata writes, in his letter to Toki, about how he came to make successful discoveries of rare specimens of algae, lichen, fungi and slime molds. It was dreams which he had while he was in Nachi, that led him to locate those rare objects. He interprets the function of dreams in terms of alaya consciousness (alaya-vijnana), which according to the Buddhist philosophy of *yuishiki* (vijnaptimatra), means 'supreme wisdom', 'supreme enlightenment', or 'the basis where all the accomplishments of the past activities are kept, and from where the future life is to emerge' (20). Minakata maintains that the individual's mind is not singular, but it consists of multiple selves or minds. 'At the time when some unusual ideas come upon us, or we may dream about some mysterious matters, the unconscious self (alaya) is then activated under the surface of the superficial level of everyday consciousness' (21). There is an interesting parallel between Minakata and Carl Jung (1875-1961) in their discussion of multiple selves and the function of the unconscious as the way to intellectual discovery; in their interest in mandala; and in their emphasis on chance, which Jung interpreted in terms of synchronicity. (Reflections on similarities and differences between Jung and Minakata, I owe to Professor Kawai Hayao) (22).

In summary, first, Minakata derived his creativity from the conflict of cultures, ancient Buddhism on the one hand, and modern Western science on the other, which he tried to combine encounter with slime molds, which he conceived to be the elementary form of life, as such, to epitomize nature; third, he recognized the importance of the function of dreams and the unconscious in the process of scientific discovery. (In regard to this third point, reference may be made to the *Psychoanalysis of Fire* (1938) by Gaston Bachelard (1884-1962) (23).

(20) Nagao Masato, *Chukan to Yuishiki* (Madyamika and Vijnatimatra), Iwanami Shoten, 1978, pp. 435-438.

(21) *Minakata Kumagusu / Toki Horyu Ofuku Shokan* (Correspondence between Minakata Kumagusu and Toki Horyu), *op. cit.*, p. 51.

(22) Kawai and Tsurumi, 'Shizen to no Tsukiai' (Interaction with Nature), *Kawai Hayao Taiwashu: Kagaku no Atarashii Hobo-ron o Saguru* (Kawai Hayao's Dialogues with Scholars of Various Disciplines: In Search of New Methods of Science), Mita-Shuppan, 1994, pp. 252-282.

(23) Gaston Bachelard, *La psychanalyse du feu*, Gallimard, Paris, 1938; translated into Japanese by Maeda Kosaku, and published under the title: *Hi no Seishin Bunseki*, Serika Shobo, 1987.

4. From Mandala to Chaos

Two years ago, I happened to watch a television series of dialogues between Ilya Prigogine (1917-) and Nakamura Keiko (1936-), a life-scientist, who proposes a new field of life science based upon the theory of genome. Toward the very end of their discussion, Prigogine said, 'I owe a great deal to contemporary biology'. Being asked by Nakamura, 'In what way?' Prigogine answered, 'It's slime molds! Through studying slime molds, the problems of chaos and chance become very clear to me'. I was very much surprised. What a coincidence, or 'synchronicity' according to Jung'? Approximately one hundred years ago, Minakata adumbrated a paradigmatic change in science, in terms of mandala. And now faced with another turn of the century, Prigogine is working on a paradigmatic change in terms of the concept, chaos.

The problems of chance in relation to necessity, presented in a rather crude form by Minakata, are now tackled by Prigogine and others in more rigorous and sophisticated ways. The significance of this paradigmatic change is not limited to natural sciences; it also affects the social and human sciences, and moreover, most importantly, influences the lives of humans and non-humans on the globe. There are various approaches from diverse cultures to the problem of chance. Minakata-Mandala is a salient example of how confrontation and integration of diverse cultures may contribute to the emergence of a new paradigm for the future.

CULTURAL COMMUNICATION: MAJOR CHALLENGE OF THE FUTURE

by Mahdi Elmandjra

There are few areas, today, where science, technology and culture meet to the point of fusion as the one of cultural communication. The 'Highways of information' which are the byproduct of scientific innovation and technological creativity raise a number of basic issues when it comes to the content of the information transmitted and the tracing of the networks used.

Sean MacBride warned many years ago in his report to UNESCO:

“The technological explosion in communication has both great potential and great danger. The outcome depends on crucial decisions and on where and by whom they are taken. Thus, it is a priority to organize the decision-making process in a participatory manner on the basis of a full awareness of the social impact of different alternatives’.

(‘Many Voices, One World’, pp. 258-259, UNESCO, Paris, 1980).

The problem of participation in the information sectors remains a very serious one. It is the key to cultural communication within and between countries. The present international information order generates and maintains a great variety of inequities. Peace depends more than ever before on a balanced cultural communication. The attainment of such a balance in a reasonable time is one of the most challenging tasks for the future of mankind.

Information has become both a source and an instrument of political, economic, social, cultural and scientific power. The very concept of communication is evolving rapidly due to technological progress and to the quantitative expansion of the use of the media which are more and more interdependent.

According to an OECD study, communication became the first industry of the world in 1987 and it is expected to represent 40% of the world's industrial production before the end of the century with a turnover of over \$ 1.000 billion dollars (1). In 1993, the business of the 15 largest telephone companies in the world represented over \$310 billion dollars with NTT (\$ 60.1 billion) and ATT (\$ 39.8 billion) accounting together for \$ 100 billion.

(1) *“Technologies d'information et de communication pour le développement économique”*
OECD, document 8548, Paris, December 1987, p. 13

Decision-makers in the Third world countries have concentrated their efforts on the political aspects of information and its use as a tool of government and not enough, if at all on its economic, socio-cultural and technical functions(2). If we take Africa, as an example, we discover that its compound share of the world's media is around 2% whereas its share of the World GNP is 35% - there is thus a direct correlation between these two figures.

Communication affects the meaning and content of sovereignty as boundaries are overtaken by more and more performing technologies. These developments have several positive aspects for cultural communication since they improve the quality and the quantity of the information exchanged but they also have serious drawbacks such as the flagrant unbalance between the sources of this very information.

There is a quasi-monopoly on the part of about 5 countries which control over 90% of these media whereas the whole of the Third world accounts for less that 10% of the total communication expenditures of the Planet. If we limit ourselves to the advanced technologies then the share of the Third World plunges down to less than 3 %.

Distortions of this order do not promote a sane and balanced cultural communication. They constitute a danger for the preservation of cultural identity as well as of cultural diversity. Unfortunately, the trends of the projections for the years to come indicate an accentuation of these inequalities rather than their reduction.

The world is undergoing a major mutation from a society based on production to a society based on knowledge and in which information and processes are more important than the products. Underdevelopment today must be seen as the consequence of the inability to generate, process, update, transform, communicate and share information.

In a study on *'Information and Development'* which dates back to 1980, I wrote:

'The dilemma which the information revolution raises can be put as follows: on the one hand, no development process of any kind can take place without a heavy reliance on information and communication technologies; on the other hand, these technologies and the information which they carry are highly value-loaded, they disrupt development patterns and seriously affect the socio-cultural environment of the industrialized as well as of the developing countries '(3).

(2) See Mahdi Elmandjra, *Media and Communications in Africa, the Weight of Advanced Technologies*, in Academia, No. 5, October 1988, Academy of the Kingdom of Morocco, Rabat.

(3) *Informatics is there a choice?* in Development, Journal of the Society for International Development (SID), 1985: 1, p.,3, Rome

The challenge of cultural communication implies the solution of the above dilemma. A most difficult task for the developing countries because it calls for a complete revision of the existing models of development with more emphasis on self-reliance and endogenous value systems. It also calls for greater investments on human resources and scientific research, the encouragement of innovation and the respect of human rights.

Even if all of these conditions were met, many countries would still be unable to meet this communication challenge because they do not have the '*critical mass*' required. The communication technologies call for very heavy investments in human and financial resources and for large international markets. There are no more than about 10 Third world countries⁽⁴⁾ that can come close to meeting these requirements.

The elaboration of joint projects between developing countries has thus become a necessity for socio-economic development as well as for political empowerment and cultural survival. A coherent South-South cooperation would not only make an efficient contribution to the development of the Third world, it would also greatly facilitate the promotion of mutually beneficial North-South programmes and the harmonization of their cultural content so as to preserve diversity and enhance human solidarity.

The problematique of cultural communication is of a planetary nature and requires planetary visions and planetary solutions with the full participation of all concerned - that is of all of mankind.

Impressive technological advances have greatly improved the quantity and the quality of the transmission of information with a reduction of 'noise' and distortion. This has not been accompanied by comparable results at the substantive level which suffers from greater distortion than before and from problems of feedback. The information follows a one way track. What is missing is a readiness to listen to the other.

New democratic processes will have to be invented to regulate the flows of international communication. They will have to respect the fundamental principle of the freedom of information and the need for a minimum self-protection (or cultural self-defense) in the case of countries which are subject to aggressive programmes - freedom with responsibility.

With the end of the ideological East-West feud and of the cold war, culture is increasingly becoming an area of conflicts. Ever since 1978 I have been maintaining that the greatest problem in North-South relations concerned cultural communication⁽⁵⁾.

⁽⁴⁾ Among these one can mention China, India, South Korea, Brazil, Indonesia, Mexico, Taiwan, Hong Kong and Singapore.

⁽⁵⁾ *Political Facets of the North-South Dialogue*, North-South Round Table, Working Paper n°4, First Session, Society for International Development, May 1978, Rome.

In 1986, during a television programme in this very city of Tokyo, I said that the causes of future conflicts will be essentially cultural(6). This prediction, unfortunately, turned out to be exact with the 1991 Gulf War which was, in my view, a '*civilizational war*' (7). Many other armed conflicts such those in Ex-Yugoslavia, in some of the Asian Republics of the former Soviet Empire and in certain parts of Africa can also be considered as cultural confrontations.

How can science and communication be mobilized to reconvert culture to its original functions of creativity, generosity, solidarity and love? This question raises ethical issues as well as political, socio-economic and technological problems. It conditions our vision of the future and calls for a radical transformation of our mental structures to improve our cultural communication which is the most efficient instrument of peace.

Since wars have become the expression of cultural arrogance, *cultural humility* is now the new name of peace. Cultural communication has thus become one of the major challenges of the future with great opportunities and dangerous risks(8).

(6) NHK television programme of 2 October 1986, on the future of international cooperation, with the participation of Hisanori Isomura and J. J. Servan-Schreiber.

(7) See '*Der Erste Weltkrieg der Kulturen*' in *Der Spiegel*, 11 February 1991, Hamburg and Mahdi Elmandjra, *Première Guerre Civilisationnelle*, Ed. Toubkal, Casablanca, 1991.

(8) As an expression of my conviction as to the role of cultural communication in the building of peace, I have setup in 1992 a '*North-South Cultural Communication Fund*' which is financed from the royalties of the sale of my books. This fund has enabled me to award the '**North-South Cultural Communication Prize**' on the beginning of every year since January 1992. The Laureates have been: Ahmed Sanoussi & Larbi Sebban (Morocco) in 1992, Ramsey Clark (USA) & Munir Bashir (Iraq) in 1993, Ibrahim Spahic (Bosnia) & Taib Saddiki (Morocco) in 1994, and Yuzo Itagaki (Japan) in 1995.

PROGRESS IN BIOLOGY - PROSPERITY OR TRAGEDY

by Professor Rem V. Petrov

Many scientists are not keen on forecasting feasible progress in science. When they do they nearly always make their predictions optimistic. The optimism in their scientific predictions can be explained by at least three considerations:

First, optimism stresses the power of science; there are no barriers for it; cancer will be conquered; the life span appears to grow by tens of years, etc.;

Second, optimism is considered to be pleasant for society at large, for broad masses of population, for the 'common people'; an optimistic scientist appears to be preferable to a scientist expressing pessimism;

Third, an optimistic prediction is not punishable, since it cannot fail; there is always a way out - it's time has not come yet. The problem will be solved later. So, the optimistic forecasters are wiser than their pessimistic counterparts.

In other words science, as part of culture, has provided modernization, continued to improve civilization's quality of life in the past and promises still greater progress for humankind in the future. Of course water and energy problems, health protection and malnutrition will be solved. Biology will play an important role in the solution of problems facing humankind, including even energy. It is precisely biology, I stress, and its branches such as genetics, biochemistry, microbiology, cytology with the new synthetic disciplines as molecular biology, gene engineering, biotechnology and immunology that will ensure the solution of major problems of raising the biological quality of life - health, nutrition and longevity. A number of severe diseases will be conquered. New animal or plant species will be created and flowers never seen before will bloom all over the planet. But we need to be careful with an absolute optimism. We have to have a little bit of pessimism, creative pessimism.

An optimistic future of biology contains two restrictions. One is associated with the political health of society; an ever present determiner of the utilization of scientific achievements. Science strives to reveal phenomena whereas society utilizes the discovered phenomena for good or for evil. Of course scientists, politicians and society have to be cultural and ethical enough to utilize biological as any scientific achievements for good not for evil, because it would be not excusable mistake. There exists a second danger in relation to biological sciences, perhaps, more so than to other disciplines. It is inactivity. These two restricting factors tend to poison an optimistic future portrayed for both biology and mankind

at large. As an example of an initiative designed to promote a positive political climate and combat inaction, I would like to bring to your attention the growing role of UNESCO in promoting the most up-to-date trends for progress in biology toward humankind's prosperity and increases in the quality of life.

Through the initiative of Professor Federico Mayor, Director-General of UNESCO, work on setting up a new Standing UNESCO Committee on Molecular and Cell Biology was begun several years ago. I am the Vice-Chairman of the Committee, Professor Azzi (Switzerland) is the Chairman. The aim of the Committee is to focus biology potentials on the principal and most promising trends of modern biology and to establish a network of leading biological institutions throughout the world. Genetic engineering and immunology have been included in the program of the Standing Committee on Molecular and Cell Biology. The very fact of uniting scientists working on molecular and cell biology problems under the authority and prestige of UNESCO is widely regarded as a significant step toward understanding the social significant of 'hot spots' of contemporary biology.

Humankind must look ahead with its 'biology eyes' open in order to realize the great potential of biology. The title of this paper is 'The Progress in Biology - Prosperity of Tragedy'. With this title, I stress that the potential of biology has two sides.

It is my belief that the potential of biological science helps ensure the prosperity of humankind, despite the growth of human population on the earth and the proliferation of new strains of viruses and bacterium. We must develop biology and biotechnology if we wish to ensure life and health for everybody. However, we must be mindful of the more alarming aspects of the biological progress. Some of these products must be banned throughout the world and some must be actively controlled. If not, the resulting inactivity would result in a universal vulnerability y; danger for everyone everywhere.

I am an immunologist. Immunology is developing branch of biomedicine, wellknown today, after AIDS - Asquired, Immunodeficiency Syndrom - has appeared. Everybody has understood the importance of our body immune system to defend our health.

Immunology has become extremely beneficial for mankind. The discovery of blood groups and the development of immunization methods against dangerous infectious diseases is significant examples. Blood transfusions after immunological blood group determination have provided millions of humans with life-saving treatment for a variety of life threatening situations.

Raising specific immunity after vaccination has resulted in conquering many infections, for example, poliomyelitis. Small pox has been conquered as well completed , around the world. Many infectious diseases are now under control. However, a variety of problems in conquering infections have not yet been solved. High quality vaccines against influenza and some parasitic and enteritic diseases have not yet been developed. An anti-AIDS vaccine has not yet been introduced. Modern immunology is very close to solving the problems of creating these vaccines. New principles are being applied in biotechnology for vaccine production and the early results look promising.

Molecular and cellular immunology as well as immunogenetics can provide effective methods for controlling the body's immune response. This trend is most significant for the production of a new generation of vaccines. Immunologists are constantly searching for ways or overcoming immune deficiencies. There is evidence that primary, secondary and acquired immune deficiencies are occurring more and more often. The inadequacy of the immune system is a principal factor in the majority of chronic which attack living things. The widespread distribution of those diseases is apparently connected with environmental pollution, urbanization problems and ecologic shifts. The immune system of our body is considered to be a special system designed to provide a host with homeostasis defense mechanisms as well as forming within the host its intrinsic ecology or so called *body ecology*. Many voices are raised concerning problems of environmental protection, but much less is heard regarding body ecology protection.

The body's immune system, a key mechanism for maintaining the body's ecology. This system is capable of protecting a person from viral and bacterial invasions, foreign protein attacks, allergic diseases and malignancies. In my view, humankind has two alternatives - either promote research activity in basic immunology and advance as rapidly as possible on a route to overcome immune deficiencies and allergies, or be inactive and helpless in the face of extensive proliferation of these disorders throughout the population of the world, Failing to take action should cause the scientists of the world to sound the alarm. If we do not do our best, as researchers, in immunology and allergology, if we simply ignore problems of body, ecology, we surely will not stumble upon an appropriate solution for problems of humankind's health protection in the near future. The 'danger areas' located in the tend to expand quite independent y of evil intentions. And all of us have to be vigilant to prevent the *'evil'*.

Finally, there is the problem of cancer immunotherapy and how to overcome a tissue incompatibility barrier; a phenomenon widely known among transplantologists. A key for solving these problems is in the investigation of minimal differences between individual persons on the one hand, and between intact and malignant target cells on the other hand specifically y, leaving the healthy tissues intact. We have to answer the question, which protein-based structures (antigen complexes) determine these minimal differences'? Then, we need to develop a new generation of specific drugs which would be capable of killing the only malignant target cells. The utilization of monoclonal technology in this context would facilitate solving the problem, and I believe make the possibility practicable.

The symmetrical evil of this noble problem is the possibility of creating ethnic weapons. In reality, such a possibility is grounded in the recognition of the fine immunological differences between ethnic populations which leads to the creation of chemicals which have selective specific toxicity.

Let's look at some good and evil applications from genetic engineering to illustrate the symmetry of good and evil which are contained in these 'hot-spots' of modern biology.

Table 1
'SYMMETRY' OF GOOD AND EVIL IN IMMUNOLOGY

'PROBLEM'	'GOOD'	'EVIL'
Immunological Supervision (Body Ecology)	Immunity Control, The treatment of immuno-deficiencies, The Creation of vaccines of the new generation, Body Ecology	Wide spread of secondary and acquired immunodeficiencies, AIDS Autoimmune Diseases, etc.
Allergy	Triumph of Allergy	Total Allergization
Directed transport of Drugs (Immuno-Toxins)	Immunotherapy of Cancer, The overcoming of tissues incompatibility at transplantation	Ethnic Weapon

A present, the primary stage in the development of genetic engineering has been completed. Methods have been developed for introducing into micro-organisms genes taken from the unrelated species. Among the natural hosts of those genes are viruses and bacteria and donors of the genes are microbes, animals or human beings. The genes introduced were proved to be active in the new host.

Micro-organisms transformed with unrelated genes gain an ability to produce the specific gene-encoded protein in unlimited quantity. This methodology has become an integral part of the microbiological industry technology and is now exploited by manufacturers to produce various high quality proteins or enzymes; hormones (e.g. human insulin); vaccines against hepatitis for example, and certain antibiotics. Further, today's genetic engineering methodology is capable of solving problems in the production of biogas or photosynthetic utilization of solar energy.

But, there is the other symmetrical side of these achievements which is fraught with danger, I mean the 'evil' that can result from the dehumanized exploitation of gene engineering technology as a technology to create microbiological weapons. Exploiting this technology can produce the evil reality of giving natural micro-organisms the novel qualities to overcome the human body's immunity barrier or produce drug resistance in human beings.

The contemporary step in the development of gene engineering is the production of 'transgenic' plants and animals. Transgenic means the introduction of some unrelated genes or adding extra genes into genomes of either animal or plant gametic cells. Such a procedure would be expected to produce a birth of an unusual offspring with new qualities. For instance, potatoes, which carry leguminous plant protein encoded genes, are already

available. Tubers of such potatoes were found to be highly enriched with the protein. This example illustrates one of the ways of solving the worldwide problems of protein deficiency in both stock-breeding and within the human population. Transgenic plants which acquire the resistance to viral diseases and the producing of anti-insect drugs are now being created.

Some categories of the transgenic animals appear to be able to produce milk or wool, both with special qualities. Manipulations with a somatotropin-encoded gene, that is the introduction of the gene into gametic cells, will permit breeding of giant fishes or extremely big animals. A possibility of raising the body's resistance to infections, diseases, etc., should not be excluded as a real possibility in the near future.

Certainly, manipulations with human gametic cells genes are regarded as beyond the social morality and ethics for the present. However, treatment and correction of some hereditary defects in human somatic cells seem to be becoming a reality. Gene therapy can be applied to the treatment of some genetically predisposed hemopoietic disorders. The diseased hemopoietic cells can be removed from a patient's bone marrow and then be further in vitro specifically y treated. The imperfect genes found in those cells can be replaced with their healthy counterparts. And then, it is not difficult to bring the restored hemopoietic cells back into the patient's body.

The adoption into practice of the achievements in transgenic plant and animal technology has began. It is my firm conviction that mankind should be careful with these achievements. I think it is the time to sound the alarm 'Save Our Souls'. The dangers as indicated in the slide are real, expansion of the transgenic plants over the natural environment, or even, the degradation of natural biocenosis with unpredicted consequences. The possibility of monstrous living things in nature, particularly, aggressive animals or insects, cannot be excluded.

Table 2 presents a few examples for immunology of good and evil applications of advances in biological science.

Table 2
'SYMMETRY' OF GOOD AND EVIL IN GENETIC ENGINEERING

'PROBLEM'	'GOOD'	'EVIL'
New Genes Introduced into Micro-organisms	Microbiological industry and Biotechnology; Proteins, Hormones, Ferments, Biogas, Photosynthesis, Concentration Ore, etc.	Microbiological Weapons; New Variants of Micro-organisms with heightened infection efficacy. Capacity to overcome immunity Resistance to antibacterial drugs, etc.

New Genes introduced into Plants

The creation of Transgenic plants with heightened content of proteins in cells resisting viruses and insecticides and producing natural insecticides, etc. Ecological Expansion of artificially created plants with the disturbance of natural biocenoses.

New or Additional Genes introduced into Animals

The Creation of Transgenic Animals; Hereditary diseases treatment in people production of proteins in Animals, an increase in productivity and resistance in agricultural animals. Spreading of monsters in nature (abnormal aggressive animals and insects) with unpredictable consequences

How to control it? Who has to be a controlling body? A scientist himself? A pharmaceutical or biotechnological industrialist Special National Committee, like FDA in USA? Or may be humankind needs to have a special international body for regulation and controlling gene-engendering activity?

In several countries there are special governmental documents for this reason. Several months ago Russian Parliament has issued a law intituled "State politics in gene-ingeneering activity", Russian Academy of Sciences, Russian Bioscience Commission and myself personally were pushers to create the law. What is a basis for the control of gene-engeneering activity? Let me show a scheme to levels and mechanisms of the control.

Of course, we need to have a state social-scientific committee powerfull enough to permit or to restrict any steps of gene. But I believe humankind needs to have an international, may be United Nation's body in GEA. With this opinion let me finish my report. Thank you for your attention.

**TECHNOCULTURE ON THE THRESHOLD
OF THE TWENTY-FIRST CENTURY,
FROM THE AGORA TO THE INTERNET**

by René Berger

It is a long way from the Agora in Athens, which covers a few hundred square metres, to the Internet, which covers the entire world and has some 30 million users yet where, in the days of Socrates, exchanges take place instantaneously, or, as we say now, in real time(1). This abrupt opening merits clarification,

It has become a commonplace to repeat that accelerated change has become our lot. Not a day goes by without us learning of some discovery or invention that is going to 'change the world'. To this there are two normal and opposing reactions: on the one hand there are those who rejoice in the name of a blind triumphalism, and on the other those who get upset in the name of a humanism that is no less blinkered. Both reactions are equally inadequate, based as they are on the long-held and deep-rooted belief that events and phenomena can be understood on the basis of a linear approach, with history as the model, the causal framework, the principle, the alternative, that is the choice between two terms, the tool of explanation par excellence. However, it is increasingly clear from the changes taking place in the exact and social sciences alike, and indeed in economics and the so-called cognitive sciences, that events and phenomena occur in a non-linear way, on the basis of an intrinsic and irreducible complexity which engenders unpredictable and often disconcerting bifurcations. This has been highlighted in particular by chaos theory whose fractals appear just as much in biology as in genetics and the Stock Exchange(2). For their part, the new technologies (to sum up in one word the innovations available to us all technologies), in particular information superhighways and multimedia, are radically transforming our relationship to the acquisition, production and transmission of knowledge. They have

(1) INTERNET is the largest computer network in the world, connecting tens of thousands of servers. Its main characteristic is that, in principle it is open to everyone, either to access information or produce it. This 'anarchic' network design, not in the sense of being disordered, but in the sense it being unaffected by institutional hierarchy, is so new, in any case to the European mind, that a real effort of imagination is needed to accept, or even understand, it, even though its underly by principle is straig informed. There two useful references here: the overview that appeared in Libération, 14 April 1994, pp. 14-15; and the INTERNET, Yellow Pages, by Harely Hahn and Rick Stout, Osborne McGraw-Hill, New York 1994, being a directory of the main servers by subject, with electronic addresses, including Bill Clinton's: president(a) white house .gov.

(2) See the special issue "Pour la Science", January 1995, which surveys the theory and includes an extensive bibliography.

reached a critical threshold where they are restructuring not only techniques but all our individual and collective actions and gestures, at all levels and in all fields, thus calling into question and relationship to our mind and to our body. The age-old system of representation which we have lived until now is barsting at the seams. A new kind of civilization is emerging whose linearments are only just beginning to show through and which progresses by flishes. For instance, all-powerful Japan, the first to invest in high definition television (HDTV), which sunk billions of dollars into developing its 'analogue' MUSE system, is negotiating its conversion to 'digital' which, so the Japanese experts now say, is the only means of keeping up with the process of ongoing change. Maybe the same thing will happen to virtual reality, which transforms our image of reality to the extent of attempting to substitute itself for it. Clearly we can say that a new stage in evolution dawning, provided we add straightaway that it will not merely carry on from the past. We are talking once again about a non-linear process, to which I propose giving the component name of apoptosis-metamorphosis, with a hyphen. In Greek, apoptosis means the fall of petals or leaves, a meaning which was adopted after some biological discoveries to describe the phenomenon by which an organism 'invents' programmed cell death, radically different from necrosis, in order to bring the organism to its finished state. 'In many populations of developing neurons, massive numbers of cells die prior to the completion of differentiation. This naturally occurring cell loss is not a pathological process but, as the name implies, it is a normal feature of neurogenesis. ..'(3). Far from enlightening the scientific community, this admitted by disconcerting discovery took 20 years to make its mark: 'Historically, the study of naturally occurring neuron death has traced a rather interesting, albeit somewhat chequered, pathway from its beginnings at the turn of the century to the present. Despite the fact that after the important discoveries of Hamburger and Levi-Montalcini, in 1949, it was no longer possible to deny the existence of neuronal death, it still took more that 20 years following that date before this phenomenon penetrated very deeply into the thinking of the neuroscientist''. It has been realized that the phenomenon is very widespread and can be observed in particular in animals subject to radical changes or metamorphoses. Thus some cells or groups of cells, or even entire organs with 'transitory' functions purely and simply disappear at a later stage, for example the tadpole's tail and the human embryo's interdigital membranes.

(3) Ronald W. Oppenheim, Naturally occurring cell death during neural development, TINS-November 1985, p. 487 (Trends in Neuroscience).

(4) Ibid. p. 493. The article is followed by an extensive bibliography. See also A.H. Wyllie, J.F.R. Kerr and A.R. Currie: 'Cell Death: The significance of Apoptosis', 'International Review of Cytology', Vol. 68, 1980, pp. 251-306. Cf. the paper delivered by Isabelle Rieusset-Lemarié at the 15th Festival of Video Art, held in Locarno in September 1994: 'When the death involved in sexual reproduction was observed', she writes, 'It was regarded as a "Fatality" of the species'. But this self-programming of death, with a view to a projected development which transcends its own end, goes beyond what was reasonably believed, accepted or rather tolerated as being biologically true. 'Handwritten text, p.8. The symposium, which I directed, was entitled : Entrer clans le XXIème siècle, de l'apoptose à la métamorphose.

The phenomenon is all the more strange in that it affects the very core of the process of hominization which, it will be remembered, 'sculpts' some hundred billion neurons inside the 'crucible' of the cranium, representing scarcely 1,500 cubic centimetres or a little over a kilo, but whose 'fire' will feed interactions and interrelations by the trillion(5), enabling human beings while remaining constrained by their individual bodies to invent a cultural environment which, as the 'crucible' of human society, adds another dimension to the physical environment.

What makes these all too brief reminders interesting is not the figures, whose huge scale is continually surprising; it is rather that current research has replaced the image of the brain, whose topography and functions we thought we had identified once and for all, by a set of elements and relations of seemingly inexhaustible complexity, there by dealing of blow to traditional methods of analysis. There has been a dual change then both in the object and in the perspective adopted to study it. So instead of seeing brain formation proceeding according to a strictly laid-down 'programme', we have discovered that right at the beginning of the process migrations of neurons take place in the primitive tube. This is an unsettling discovery for the layperson but hardly less so for scientists themselves: 'For a Cartesian mind it might seem that the construction of neuron circuits requires only the ordered contact of axons with their target neurons. In fact nature does not proceed in this way, as neurobiologists were surprised to learn a long time ago now. What happens is that the development programme seems to start by making an excessive number of interneuronal connections, which must then be sorted and selected, eliminating superfluous neurons and axons. . . The process of cell death occurs from the moment when this" population begins to establish connections with the target structure . . . This type of result suggests that neuronal death is a means of adjusting the size of a neuron population to its target territory'(6).

Let's stop here for a moment. From the point of view of neurobiology, 'neuronal death' shows - surprisingly and in any case unexpectedly - that the brain of the embryo develops as if it were learning to 'sculpt itself' by eliminating, like a sculptor, superfluous neurons in order to reveal the future form . . . Which makes one wonder about the twists and

(5) See Daedalus, Journal of the American Academy of Arts and Sciences, Winter 1988, Volume 117, Number 1, Cambridge, Mass., particularly Jacob T. Schwartz: 'The New Connectionism: Developing Relationships between Neuroscience and Artificial Intelligence', pp. 123-141.

(6) Henry Kennedy and Colette Debray, Le développement du cerveau, La Recherche no. 184, Paris, January 1987, p. 28 See also Gregor Eichele, Budding Thoughts, The Sciences, January-February 1992, New York, pp. 30-34, whose sub-title, How the Embryonic Brain Unfolds from a Simple Wormlike Tube, underlines the community of living matter in embryogenesis: '.. . The human homologue of a gene expressed in the fly's head is expressed in the human head as well. In other words, the organization of homeobox genes in the genome and the site of their expression have been conserved from the fruit fly to man', p. 34.

turns of nature. Let's stop for another moment: are not 'twists and turns' terms implying that we think ourselves entitled to expect natural phenomena to conform to a plan governed not by logic, the logic of living matter, but by our human logic'?(7)

How we understand facts, but also how we choose and interpret them, depends on how we picture the world and the mental structures we use, in close relation with the means at our disposal, to represent them. This point should especially stressed since new methods of observation and experimentation provide ever more sophisticated means. The positron camera for instance enables us for the first time ever to follow on the screen in real time the journey of a 'thought' in our brain. This makes it perfectly clear that, as I have been emphasizing for a long time, technology is not purely instrumental, as we have imagined and still imagine it to be, but that it has an epistemological power. Strictly speaking, technology does not only produce objects that are different, ~~but makes us see things differently~~. Complexity is thus born of a twin process, all the more difficult to grasp because at the moment when the image begins to change it calls into question both its content and its mode of production; simultaneously and reciprocally, the change affects the content and mode of production which gradually become established as the process goes on(8).

So without giving in to arbitrariness can we not envisage the hypothesis that apoptosis might well, from the field of biology to which it applies, also be used as a model for culture? That would lead us to postulate for example that the mental mechanisms established centuries ago are now 'withering away' like a flower or tree that has used be its sap, not to surrender to death but to regenerate the conditions for a new birth, in short, for a metamorphosis, that is a change so profound that the object that undergoes it or sets it off not only can no longer be recognized but alters its state and therefore its nature.

Surely everywhere and every day there are increasing signs of such an evolution, on earth and beyond, in space, and in the very heart of the infinitely small(9). We are in no way seeking to deny our past, but rather to discard the conceptual mechanisms which, having become residual, will if we are not careful now hinder our development. I am speaking indeed of a new alliance of Nature, Culture and Technology, sustained by values of a new kind, a meta-morphosis (meta-physics, meta-culture, meta-technology), which we will not need to undergo but to build. But first a few words about the upheavals affecting our environment.

(7) François Jacob, La logique du vivant, une histoire de l'hérédité, NRF, Gallimard, Bibliothèque Sciences Humaines, Paris 1970.

(8) Cf. René Berger, Jusqu'où ira votre ordinateur? L'imaginaire programmé! Editions Pierre-Marcel Favre, Lausanne, 1987; Télévision, le nouveau Golem, Edition IDERIVE, lausanne, 1991.

(9) See one of the founding works of nanotechnology: K. Eric Drexler, Engine of Creation? Double day & Co., New York, 1986.

The computer as Socrates at the heart of the techno-environment ?

I shall hazard the barbaric term 'techno-environment' to denote the most important revolution since the Neolithic, a term which is in any case a hybrid, and for good reason, and which paradoxically can be summed up in one sentence: while traditional techniques slowly evolved over thousands of years in time with needs, that is according to their instrumental qualities, a few decades ago new techniques started to transform themselves under the influence of the ever quickening pan of life and ever more sophisticated innovations into an almost autonomous force all too often nonthinkingly labelled 'Technology'. Contrary to what we understand by the word, Technology is not just the sum of known or developing techniques; it establishes (hence the capital T) a power of reality unprecedented in history which we could call 'technogenesis'(10) from which comes also what I am tempted to call 'techno-maieutics', with reference to the emerging 'techno-imagination'(11). The prefix techno, far from being used for the sake of linguistic convenience, designates specifically the metamorphosis which is taking place throughout our world, where nothing takes place in practice or in theory without the intervention of one or more techniques, beginning with the hybrid creature par excellence - the computer, machine, supermachine, superstar, thaumatuge, Frankenstein, the new Golem? So many names, so many attributes. And paradoxes. At least three:

1. At an initial level the computer is seen as a prodigy, having a memory in operating speed to that enable it to solve the most complicated problems. In 1981 the Cray 1 supercomputer, the most powerful of its time, processed 160 million operations per second; today the Cray T3D processes 240 times more. Astounding! And just twelve years on the Cray 1 at the Lausanne Federal Polytechnic where it is, the pride of that institution, is now only used as a bench in the foyer of the Computer Service. This gives some idea of the speed of progress at the moment, especially as architecture is becoming more sophisticated in turn, in particular with the advent of what is known as massively parallel processing.
2. At the second level, the computer is a tool which can convert all the different communications systems - words, images, sounds, figures, which each use a system of specific symbols - into a simple binary symbolism just as, conversaly, it can convert a series of 0's and 1's into spoken or written words, mathematical operations, drawings, paintings, sounds, noises and music. This is the principle of interactive multimedia which is in a fair way to shaking up our most ingrained practices and modes of knowledge (school, education, entertainment, production, acquisition and transmission of knowledge).

(10) Bernard Gille, Histoire des Techniques, Encyclopédie de la Pléiade, NRF, Paris, 1968. I strongly urge everyone to reread Gilbert Simondron's remarkable Du mode d'existence des objets techniques. Aubier, éd. Montaigne, Paris, which appeared in 1958; also L'intelligence d'une machine, by Jean Epstein, éd. Jacques Melot, Paris 1946.

(11) In the postface to L'effet des changements technologiques - En mutation, l'art, la ville, l'image, la culture. NOUS!, Editions Pierre-Marcel Favre, Lausanne, 1983, speaking of advent of what I call the 'techno-imagination', I wrote: 'Technologism . . . is the first philosophy to include objects and machines in its system. In doing so, it seeks not so much to know the world as to transform it. Technomorphism refers both to the power of action of technology and to its results', pp. 226-227.

3. At a third level, assisted by the development of artificial intelligence, the computer is starting to stimulate all kinds of reasoning and thought processes. For instance expert systems are developing both in cognitive and analytic form, and also in a connectionist form through networks of artificial neurons. Decision-making centres, whether political, educational, university or economic, can no longer remain on the sidelines. There is nothing information, banking transactions, administration, tax collecting, opinion polls - which means the police.

Whilst the process of hominization has taken place over thousands of years the computerization process is taking a few decades. We hardly dare imagine what awaits us at the dawn of the twenty-first century, especially since the ultimate paradox, for which we already have the proof is that the more the computer excels as a machine, the less it seems to be a machine, and the less it seems a machine, the more conscious, or close to our conscious it seems. **‘People make real tools and symbols. Both of them have recourse in the brain to the same basic equipment... Language and tool are the expression of the same property of human beings’** said Leroi-Gourhan in Le geste et la Parole. Society then has always required artists to reveal its underlying meaning. So how about the metamorphoses of art today? To what extent can they explain the change which is taking place’? These are the questions we must ask ourselves,

Art and technology

The fact is that, on the threshold of the twenty-first century, historic cultures are undergoing a decisive transformation. Despite their long tradition ‘the classical arts’ no longer seem to be responding fully to changes in our society, For the first time a new, highly complex type of culture is emerging to which I have given the name ‘Technoculture’(13), which combines changes in telecommunications, new ways of processing space and time, linguistic, epistemological and philosophical developments linked to the hybridization of our systems of thought in conjunction with the ever-growing sophistication of machines. Those artists I call ‘Technological’ are those very ones who are trying to meet the new expectations by exploring the developing techno-imagination.

(12) André Leroi-Gourhan, Le geste et la Parole!, Ed. Albin Michel, Paris 1964, p. 88

(13) I introduced the neologism ‘technoculture’, now in current usage, in La mutation des signes Ed. Denoël Paris 1972.

A schematic table of technological arts or techno-art might look like this.

- *Video art*, videotex (teletext), which uses video recorders;
- *Computer art*, computer graphics, digital art, graphic data processing, computer imaging, computer animation, and so on, which use computers;
- *Holography*, holographic art, holograms, which use lasers;
- *Reprography*, copy art, which uses photocopying techniques;
- *Artistic telematics*: conferences or seminars via satellite, telephone, picture phone, radio, TV;
- *Virtual reality*, which covers research and work intended to produce a new dynamics inside cyberspace which is its new focus of expression(14);
- *Artificial Life*, which, in addition to research carried out with a view to creating hybrid beings capable of autonomous behaviour, is trying to make room for artistic initiatives by linking information technology resources to those of artificial intelligence(15);
- to which should be added the fast-developing *global computer networks*, as pre-figured by the information superhighways (or infobahns) like the famous Internet or Net which is growing exponentially with the aid of the WorldWide Web (WWW) or Web.

Such a list is neither exhaustive nor definitive - there are many other movements and trends. Nevertheless, I think it is reasonable to group them together, as I have suggested, under the heading of technological art(s), singular or plural, or under the generic term Techno-art, the determining factor being that all these activities have set themselves a deliberately artistic aim and purpose which are organically tied to one or other of the new techniques used, either singly or in combination. The other point I would like to emphasize is that this a non-linear Process. Video art, computer graphic art, holographic art and telematic art did not originate from the 'classical' art any more than from the mere application of the techniques they use. Their specific originality lies in a radical restructuring of the system of art and a no less radical restructuring of the way in which it is approached. That is what I will attempt to show briefly with a few examples.

(14) Howard Rheingold, Virtual Reality, The Revolutionary Technology of Computer-Generated Artificial Worlds, Summit Books, Simon and Schuster, New York, 1991.

(15) Steven Levy, Artificial Life, The Quest for a New Creation, Pantheon Books, New York, 1992

Survey of video art

Video art has been in existence for almost forty years now, four decades of an existence which remains - and the reservation is charged with meaning - circumstantial (16). Why? Firstly for a reason which stems from the nature of the medium. 'Classical' works of art, paintings, engravings, drawings, the decorative arts, are characterized in our market economy by a value which varies according to the fame of the artist and the 'rarity' of the works, in short according to supply and demand. Video art based on an electronic technology can, by definition, be reproduced indefinitely, so with little or no commercial value it does not really interest collectors. Only a few institutions, a few museums and universities, mostly in the United States, aware that a new form of artistic expression is emerging, have opened their doors to it. The first paradoxical effect is that video art shows up the limitations of a system where everything, even the mechanisms of the art market, is shaped by the economy. This means admitting crudely that in spite of its best efforts it is still today a 'marginal' activity. Yet the second paradox is that instead of fading away and disappearing, video art continues to demonstrate growing vitality as evidenced by the many festivals devoted to it throughout the world (17). The third paradox, even more disconcerting if that is possible, is that it might be assumed that while the public at large, attached as it is so the traditional arts, is proving shy, television companies for their part should have very early made abundant use of artists who employ the same technique as them, based on the same video signal. But not a bit of it. Apart from a few sporadic experiments in the United States, Canada and here and there in Europe, television has remained in the thrall of ratings (the god of statistics, possessing neither soul nor face) which alone decide the fate of programmes according to how they conform to their own idea of what is real and their own idea of the audience.

It is on this point that video art demonstrates its originality most radically, which explains both the interest it arouses and the marginalization from which it suffers. For it represents nothing less than a change of topic, that is a change which does not consist simply in varying content, in which case it would remain inside the system but a change - and this is the basic difference - that transforms the very nature of the system.

(16) Cf. La problématique de la vidéo dans le monde contemporain, "Création artistique et art vidéo", UNESCO, Reports and Studies of the Division of the Cultural Development, 25-26, René Berger with Vittorio Fagone and Angiola Churchill, Paris, 1987.

(17) I will only cite one of the first in Europe, the Locarno Video Art Festival, founded in 1981 by Rinaldo Bianda, to which I have contributed since the beginning.

By topic(18) I mean all the conditions which constitute the field of action of a given medium, all its technical, social, cultural and political aspects, in other words all the typical relations which arise from an activity or situation which is deeply rooted in our behaviour. Thus the topic of television is based on the one hand on the bipolar relation between the viewer and the set, and on the other hand on the organization of the televisual language according to its rules, which are on the whole those of narrative and 'realism', rules which under the ratings regime are both normative and prescriptive.

The initial effect of video art is what I refer to as the dis-location effect, which almost always acts upon viewers as a shock, a surprise and in any case a feeling of strangeness. Taken aback, they wonder how 'things' can appear on the box in a way that is so radically different from the way they are presented in the programmes they usually watch. What is happening is that even though there is no technical distinction between video and television, we are dealing with two kinds of phenomena, two different forms of reality. So just as video art has called into question the topic of plastic arts, which is subject to the logic of the market, so it questions the very nature of the electronic image, which television wants to make us believe merges with reality when in fact it is always processed and hence constructed. That is why many video cassettes, often ironic and full of humour, challenge the stereotypes of television, exploding in one go the medium's referential illusion and the viewers' reverential collusion.

(18) Topos (plur. Topoi) means place in Greek. In Aristotle, topics are the study of places, i.e. the method of argument whereby the different possible points of view can be considered regarding a problem under debate (Topics, the oldest of the treatises which form the Organon, by Aristotle). In Freud, two topics are commonly distinguished: the first according to which the contents of the mind are the unconscious, the preconscious and the conscious-mind: the second, which is based upon the id, the ego and the superego. For me, topos or topic refers to all the places and practices characterizing the activities taking place simultaneously within given contexts, situations and procedures. The importance I attribute to techniques and the increasing role they are playing in almost all activities leads me to group them under the term techno-topoi. While the term is perhaps inelegant, it has the merit of avoiding laborious, inaccurate circumlocution. By almost bonzerly proclaiming itself to be a neologism, it seeks to bring out what is doubtless the most significant fact about our age, namely that nothing, or almost nothing, is now produced without the intervention of one or several techniques and that they are now therefore part of our field of action all over the world and even beyond. Any change of topic implies a process of apoptosis-metamorphosis.

Next to the dis-location effect which I have just briefly addressed, video artists reveal themselves through a power of trans-location. I am deliberately using this word, at first glance strange, instead of 're-location' which might have been expected and that I have indeed used in previous writings. This is because we are not talking about a definitive break with a given system, that of the classical arts, nor the proclamation of the mere existence of technological arts, but with the realization that different systems are evolving which require equally different behaviour and ways of judging. The situation is all the more difficult because it is not strictly speaking a 'situation' but a transition. While it is easy to distinguish between two different states of an object or a thought, it is something completely different to attempt to follow them in the actual movement of their transformation.

An example serves to clarify this point, which is hard to grasp in the abstract. Monovideo, as I call it, is the tape the artist creates and presents either on a monitor or a television screen. However diverse may be the content and style, monovideo functions in a relatively straightforward situation: on the side the projection of the tape, on the other the 'videoviewer', i.e. a classic bipolar relation, provided we immediately make it clear that the video space is not reducible to conventional Performing space just as the experience of which we are a part is not reducible to the experiences offered by the conventional audio-visual media such as cinema and television.

This emerges with exemplary clarity in multivideo which, unlike monovideo, involves a complex environment formed of different elements and modes of expression such as installations, sculptures and video actions. Whatever the elements used in these environments - cameras, chairs, ladders, slides (Les Levine), frogs, chickens (Frank Gillette), TV sets and houses plants (Nam June Paik), marble plaques or garden spades (Fabrizio Plessi) - three situational effects at least are activated: firstly, the bipolar relation is replaced by a multipolar space; secondly, the 'accessories' used by the artists are detached from their habitual function and acquire an artistic purpose; thirdly, there is a need for us to change our attitude as mere spectators in order to be receptive to works that are direct experiences engaging us at several levels of the multidimensional space thus created. Apoptosis-metamorphosis is not just a compound noun; it means acting out the process it denotes.

(19) Thus Wolf Vostell says: 'When I link put a television set and a sickle or a pile of shoes, it is not a question of obeying some formalist principle in order to create a moving plastic object appropriating space, but of reaching a psychological truth which is conditioned by the fact that the sickle and the shoes take on their true significance only in so far as they are set in the context of a television programme. The outcome is the simultaneous emergence of a plastic reality (a sculpture-event) and a psychological revolution closely bound up with the television programme'. Quoted by Dominique Belloir, 'Video Art, Explorations' Cahiers du cinéma - Special issue -10, p. 27.

"Art and. the computer

And so the computer in turn is completely disrupting the situation, because it is the hackers, the 'heroes of the computer revolution', as we are reminded by Steven Levy, their historian, who paved the way for the creative use of computers by affirming from the beginning, that is as early as about 1960:

- that access to computers as to any other source of information must be free;
- that we must be wary of any centralizing power and encourage decentralization;
- that computers can create art and beauty;
- that they can change life for the better

... Like Aladdin's lamp!.. (20)

If I go over the saga or epic of the first hackers, reducing it to the absolute minimum, it is not so much to pinpoint a moment in history that has mostly been forgotten as to conjure up the spirit that actuated not only a group of young people for almost two decades but at the same time actuated information technology in its beginnings by freeing it from exclusively technical and economic imperatives to turn it towards the marvelous, to fantasy and the imagination, the soul, in short 'the hacker ethic', to use Steven Levy's phrase, which paved the way for metamorphoses of artistic creation. It was moreover not long before many artists followed the lead of the first hackers, artists who, even though they experience the 'marginalization' of video artists, still pursue their research, based on the metamorphosis of analogue images into digital images. The latter 'is no longer the imprint of a burst of photons emitted by the object to be represented, which is registered on a chemical or magnetic medium, it is a matrix of numbers calculated by the computer using programmed instructions'. Technically, aesthetically and epistemologically, this represents a new departure. Nothing, neither two-dimensional or three-dimensional images, can resist the uninterrupted stream of their metamorphoses as evidenced by, among other things, Mandelbrot's fractals which coil and uncoil in the infinitely large and the infinitely small alike(22),

(20) Steven Levy, Hackers - Heroes of the Computer Revolution, Anchor Press/Doubleday, Garden City, New York, 1984.

(21) Edmond Couchot, Images: de l'optique au numérique. Ed. Hermès, Paris, London, Lausanne, 1988.

(22) Benoit Mandelbrot, Les objets fractals, forme, hasard et dimension, Ed. Flammarion, Paris, 1st edition 1975. Frontiers of Chaos - Computer Graphics Face Complex Dynamics is a traveling exhibition which illustrates fractal geometry. H.O. Peitgen & P. H. Richter have written a book about the exhibition, The Beauty of Fractals - Images of Complex Dynamical Systems, Springer-Verlag, Berlin, Heidelberg, New York, Tokyo, 1986.

Then again, the computer broadens and enriches our field of visualization through its almost unlimited power to simulate. There is hardly anything that can not be 'played' or 'replayed' using a literal] y inexhaustible mathematics model. AMAP (Workshop for the 3D Modelling of Trees and Plants) enables everyone to 'create a realistic and aesthetic plant... Just choose a plant from the catalogue and make it grow, flower and bear fruit at will'. All on screen. With the additional option of 'creating entire forests with different trees'. So it goes from the Big Bang to the heart of the atom, from galactic collisions to the evolution of civilizations, to the temples of Karnak and the Abbey of Cluny which can be 'revisited' electronically in situ. This also sheds light on the world-wide popularity of video games. You can set off in a car to negotiate a hair-raising journey on a road strewn with pitfalls; or you can pit your skills to shoot down the enemy' airplane, or you can confront monsters which make the Lerne hydra look like a character from a pantomime. The battle between Nintendo and Sega though is a real one as they multiply technical and psychological refinements, especially as adults in turn are becoming involved, and with mounting enthusiasm.

Simplifying excessively in conclusion, we may say that up until now images have always had and retain an analogical status which is based on the order of representation. On the other hand, computer-generated images, for the first time, do not refer to the world as we know it or think we know it; they take shape around our evolving techno-imagination just as it in return it helps to form them. 'Synthetic strangeness' is a dimension of our new world which engenders new 'creatures' which demand in turn new attitudes.

Lasers and holographic art

The same applies to artists working with lasers ('Light Amplification by Stimulated Emission of Radiation'). Unlike 'spontaneous' light sources, which are those of natural light, the laser 'tames' photon activities by generating synchronic vibrations which give light a coherence whose effects can be controlled. For this reason the number of its applications has steadily been increasing. More flexible than the sun, the laser makes light of material resistance; more powerful than Zeus's thunderbolt, it scans space to the limits of the sky. It is what numerous science-fiction writers had dreamt of and what Ronald Reagan almost turned into a reality under the ironically tragic name of 'Star-Wars'. Thus the laser, starting off as a modest by technical acronym, now embraces a semantic field that has taken it to the edge of universal catastrophe. And indeed its lightning journey could well be that of any other technique, from the 'invention' of fire to nuclear energy, except that artists have always derived, from the dawn of humanity to the present day, and continue to derive something else from techniques, primarily the certainty that they can avoid being just users, in order to participate in the creation of Meaning and Beauty.

(23) AMAP, Atelier de Modélisation, 3D des Arbres et des Plantes, registered trademark marketed by SESA, Paris.

(24) Cf. La Revue virtuelle, nos. 10-11, L'art des jeux. Centre Georges Pompidou, Paris, (exhibition, July-September 1994).

So it was that from the modest invention of the method for microscopic reproduction by Gabor (1947) was born holography (from the Greek bolos, totality and graphein, to write), that other avatar of technological art born of the laser(25). Technically the hologram is the recording onto a sensitive surface of two waves from the same source; one direct and the second diffracted by the object being photographed. Together they produce a system of interferences which produce a three-dimensional image by means for laser lighting from a particular angle. Everyone knows the surprise when entering a holography museum of being confronted with a tap which dissolves as soon as you try to turn it on! The experience is even more disturbing when you go up to the face of Beethoven or a statue of the Buddha or, as I found more than twenty years ago in a San Francisco museum, when, fascinated by a Venus shining golden in the middle of the last room I passed my fingers through her as if it was though through an impalpable fleece. Does the holographic image become confused with a mirage, a fantasy, a dream that shatters on waking? Here too it is artists who have shown the way. Turning away from scientific applications which reduce the hologram to a means of heightened reproduction, they turn away too from the illusion machine which 'mimes' the appearances of reality. Thus the hologram has become for the likes of Dieter Jung, Rick Silberman, Susan Gamble and Michael Wenyon what could be referred to somewhat as a labouriously sculpture-painting in light. In my view, far from the trompe-l'oeil effects which the hologram lends itself to the amazement of the casual onlooker, holographic artists are carrying on the great tradition of stained glass from the Gothic Age when the church, so long confined within its walls, opened up to the light transfigured by the Holy Scriptures. Chartres, Beauvais and Rheims transform beings and objects into cascades of light. Unlike 'realism' whose opaqueness blinds us, the transparency of holographic immateriality enables us to see clearly. Technology, it must be repeated, is not reduced to the two faces of Janus. Thanks to artists it generates what I would call 'the instance of metamorphosis' which Mallarmé so suggestively designates by the name of the 'third fusible aspect' of meaning. A third way of looking too which, extending beyond the confines of our habits, points the way to a new vision.

(25) Peter Zec, Holographic. Geschichte, Technik, Kunst, DuMont Buchverlag, Köln, 1987. In a recent book entitled Light and Dark, Susan Gamble and Michael Wenyon specify: 'Unlike a 19th-century painter capturing an image of a rainbow as it appeared in a landscape, we are attempting here to generate the rainbow itself. The hologram acts like a prism and breaks up the light illuminating it into the visible spectrum. This spectrum is the natural phenomenon, not a portrayal of it'. Catalogue of the exhibition at the Royal Observatory, Edinburgh (July-September 1994).

And why not also mention Jean-Michel Jarre's 'laser-operas', or electronic baroque music, which has become a must of rock tours (Pink Floyd, Prince, Michael Jackson), generating a new sensibility among the public at large.

(26) Stéphane Mallarmé, Oeuvres complètes, Gallimard, La Pléiade, Paris, p. 365: "Instituer une relation entre les images exactes, et que s'en détache un tiers aspect fusible et clair présenté à la divination".

Art and computer networks

Computer networks did not wait for 'information superhighways' to make room for art and artists - initiatives of all kinds abound on the Internet. Established as long ago as 1987, Fine Art Forum is the newsletter of the Art, Science and Technology Network (ASNT) - a 'virtual' organization whose board members 'meet' . . . Anyone with access to the Internet and the correct software can log into this server from anywhere in the world and browse around and retrieve items of interest... All the services described above are free'. The server was put onto the WorldWide Web. This is the electronic address: [http: /www.msstate.edu/Fineart_Online/home.html](http://www.msstate.edu/Fineart_Online/home.html).

Many other research projects of this type exist, starting from the new computer-generated 'cyberspace' which give birth to 'cyber art'. Unlike what is conventionally referred to as 'computer art', 'computer graphics' or 'graphic art', (too) often displayed in galleries in the manner of traditional exhibitions, 'cyber art', has no materiality and therefore no 'products' to display or sell and so it stresses communication systems in themselves in order to explore the creative process to which they hold the key and which it is up to new artists, ' cyber artists', to reveal and construct. Instead of creating an individual work which is distributed to reach an ever wider audience (one-way direction), artists working with telecommunications systems are experimenting with another paradigm of cultural production which consists in getting the audience itself to take part in the production, one of the aims being to create nothing less than 'virtual communities' which can evolve through interaction. This, it should be clearly understood, has nothing in common with television gameshows, those mostly pathetic rituals which blend the shrieks of the winners with the applause of studies audiences, usually recorded. As Roy Ascott, one of the pioneers of technological art, reatly puts it: 'Connectivity, interaction, and emergences are now the watchwords of artistic culture. The observer of a work is now at the heart of the creative process and no longer a spectator on its edges. 'He takes the opportunity to pay tribute to Jackson Pollock' who created the aesthetic possibility y, and hence authorized the emergence, of our own radical constructivism within the cybersphere' (28). This reference seems worth noting to me for two reasons: firstly, I share the writer's opinion of the importance of Pollock; and secondly, in rising up against the artificial contrasts between traditional art and technological art, Roy Ascott clearly shows how art evolves through successive non-linear metamorphoses. That is what I myself have been trying to do for a long time, convinced us I am that such metamorphoses are always guided by the creative spirit.

(27) See the programme of the 14th edition of Imagina, Monte Carlo, February 1995, which is devoted to cyber art, under the title: L'ère Cyber.

(28) Roy Ascott, De l'apparence à l'apparition: communication et conscience dans la cybersphère. 'Terminal', Spring 1994, Paris. Quoted pp. 31 and 35.

The phenomenon is an important one as computerization is spreading through the entire art world. Already most museums have put their collections into machine-readable form or are in the process of so doing. However, over and above this work of conversation which is part of their traditional function, they are beginning to develop in radically new directions. As early as 1991 the National Gallery in London opened its 'Micro Gallery' in which the main works of art can be seen digitalized on screen, with all the extra facilities such image processing permits. Without a doubt such installations will gradually be replacing the 'audiovisual displays' that, as he may need to be reminded, were acquired by museums scarcely more than ten years ago. The computerization of collections has significant consequences. First, it arouses cupidity, as in the case of Bill Gates who has already brought out a CD-Rem on the London experiment and means to carry on, despite the resistance of curators, shocked at what they see as the greed and off handedness of the people at Microsoft. The other consequence is more radical. It consists in nothing more or less than allowing direct access to artistic treasures through personal computers to anyone, whenever they want, wherever they are. What this means is that museums, or some of them in any care, are rushing to get onto the Internet⁽²⁹⁾, for instance the Carlos Museum in Atlanta, one of the first if not the first. For their part the Whitney Museum and the Brooklyn Museum are trying parallel experiments. As for the Getty Foundation, time to its exceptional reputation and resources, it is currently making a worldwide study of the whole problem posed by this revolution whose implications are far more than just technical. Computer culture, now developing, through both individual computers and world networks - and this is indeed what it is - is then changing our ways of accessing, producing, transmitting and structuring information. 'Virtual' visits will be organized according to the individual's needs or tastes, Forums, also 'virtual', will bring together in 'real time' visitors, curators, historians, critics and collectors. Such a dynamic restructuring of the field of art can, needless to say, be extended to all the exchanges that make it up. This incidentally is why some museum directors do not hide their fear that pixels will displace original artwork, leaving them with deserted museums. I believe this is a groundless fear, as I am convinced on the contrary that the sight of 'virtual' works on a screen can only stimulate the desire to go and see them in situ. Up to now at least first-hand experience has not been superseded by the indirect, surrogated experience offered by techniques, however sophisticated they might be. Which goes to show that, far from supplanting our native sensitivity, the new technologies also heighten them in their own way, but differently. This will explain why it has meant so much to me to seek to extend the memory and action of a son who departed this live too soon by putting onto the Internet an initial overview of the artworks he surrounded himself with and the tens of thousands of slides he collected during his many

(29) See note 1. For museum servers already connected or in the process of being so, see, in particular, the WWW Virtual Library from CERN, Yahoo (Stanford), the National Center for Supercomputing Application (NCSA).

(30) The Pixels and Perils of Getting Art On Line, by Phil Patton, New York Times, August 7 (Section 2, pp. 30-31).

journeys. Under the title 'WORLD ART TREASURES' it is my hope that I shall thus see take shape, after Malraux's 'Museum without walls' (Musée imaginaire) the first 'on line' electronic Museum without walls of the next century(31). The 'Pilgrimage to Abydos' may be seen in this context as one of the first attempts to recover by computer network if not a sense of the sacred then at least the experience of initiation. As we cannot connect here directly with the Internet, let us briefly outline the experiment.

For thousands of years people have communicated primarily through iconic and linguistic symbols which, in order to be transmitted, have always had to be re-produced, represented by image (drawing, painting, sculpture), voice or writing, Re-production is a phenomenon we are so used to that we no longer see its complexity or indeed the conditions in which it takes place: for a message to take shape, what is required is an available space, a physical medium to receive it, an appropriate material providing guarantee of duration, and forms to express it according to rules that enable it to be both coded and decoded or, in a word, to be fixed. These conditions have governed communication since the dawn of human history and continue to do so now, so that from sheer habit they seem natural to us. Yet recently, roughly since the advent of computer science, there has been a radical revolution offers other ways, other content and other conditions, which we are only beginning to discover on and off and of which I shall merely highlight some aspects relating to time, movement and immateriality.

Whatever the differences between a Lascaux cave painting, a picture by Piero della Francesca, a Romanesque church and a sculpture by Matisse or Picasso, the works have in common the fact that time is somehow 'imprisoned' in them or as I would say 'frozen', as we talk of an image 'frozen' on the television, meaning in freeze-frame. That is not to say that time is non-existent, as is too often claimed, contrasting the spatial arts (architecture, painting, sculpture and photography) with the temporal arts (dance, theatre, ballet, cinema, and above all today television). The opposition is as false as it is specious, Any painting, any sculpture, any architecture, even if it is immobile by definition, involves an interior movement which is expressed through the artistic quality of the work and through the quality of the viewer's attention. The meeting has the power literally to 'animate' the materially static forms of the painting, architecture or sculpture and to set them in motion aesthetically. Thus it is that when a work lacks 'dynamic potential' it is reduced to an imitative representation, just when viewers for their part lack 'dynamic potential' they manage at best simply to recognize a 'subject', which they consider to be sufficient.

(31) INTERNET (WWW Mosaic Netscape): <http://sgwww.epfl.ch/Berger/intro.html> 1st programme: "Art d'Egypte, de Chine, du Japon, d'Inde, de Birmanie, du Laos" (since July 1994); 2nd programme: "Pèlerinage à Abydos, Egypte ancienne", (since December 1994); 3rd programme: "Portraits remains d'Egypte (Le Fayoum)", spring 1995.

(32) I studied these phenomena at length in my earliest books, Découverte de la peinture, Connaissance de la Peinture, (several publishers and translations). See also Henri Focillon's excellent little book : Vie des formes, Librairie Félix Alcan, Paris, original edition 1935, following by the equally remarkable essay: Eloge de la main. Mention should also be made of Mikel Dufrenne's insightful work: Phénoménologie de l'expérience esthétique, (PUF), 2 vol. 1, Paris, 1953. I would stress the high quality of these books which, by pressing the usual information given by art historians, seek to penetrate to the heart of artistic experience.

The phenomenon changed with the advent of cinema and television which both abandoned the fixed image and turned to moving images in which the action unfolds before our eyes. It is this extraordinary power which fascinated the first cinema-goers as it fascinates today the global television audience - the power to 'unfreeze' the image or word by giving to it a time dimension equivalent to that of the action and which we must stress, works its effects solely by proxy.

It is this last condition, which is also a limitation, that the television broadcasters tried very early on to 'correct' by devoting ever more space to the 'news'. Radio and television new programmes broadcast, first of all at fixed intervals, one to three times a day, then became more frequent until they became non-stop with Ted Turner's news channel CNN International, the best known and no doubt number one in the field now. The disturbing aspect, which I cannot enlarge upon here, is that such 'coverage', which is both ubiquitous and permanent, gives the impression of 'coinciding' with the actual event, as CNN International misses no opportunity to emphasize and indeed to hammer home regularly, so that one wonders whether the 'event' is not a CNN 'product'. Live television taken its limits promotes moving images to the point where they acquire an 'ontological' status which, dissolving the added time dimension of proxy experience, places us, or claims to place us, in the presence of reality itself. Is this a techno-ontology that has succeeded in concealing its prefix? I will leave the question open for the moment.

On the other hand, the internet network of networks is different from all that has gone before. Without going into detail, it may be said to be literally an an-archic network, that is, one which rejects organization as we have known it until now, based on the established distribution of positions and powers and which still structures our ways of thinking. In fact, it means entering a new world where all kinds of relation become possible, where everyone can access information everywhere and any time by connecting to the network via any computer. Above all it means the even more revolutionary possibility of being able oneself to produce information for all users with whom contact can still be made through newsgroups or e-mail (electronic mail). This technology lends itself to the wholesale restructuring of our knowledge and behaviour as they have been shaped by previous media and leads to practices that are so new that we still find it difficult to understand the metamorphoses to come.

Thus the program we have developed, 'Pilgrimage to Abydos', offers nothing less than to provide on the Internet the equivalent of a pilgrimage undertaken some 3,000 years ago by Sethi I to build at Abydos the temple which bears his name and which must be distinguished from the tomb he had dug for him in the Valley of the Kings. The challenge for the computer program is to try to reconstruct the actual itinerary of the pilgrim, not just abstractly and intellectually but 'spiritually' and 'existentially', we might say, by arranging definite stages from the first room, open to the sky, to the secret sanctuary inhabited by Osiris, Isis and Horus. The difficulty lies in rendering perceptible what I have just explained by means of concepts. In fact, in front of the screen, the 'pilgrim' is invited to rediscover the meaning of the initiation, not merely through explanations given in words or by way of illustrations, but in accordance with the inner experience realized from one stage to the next.

The radical paradox, as indeed it is, lies then in providing electronically a progression close to the real spiritual experience, as if the network, in freeing itself from a fixed space or at least from the primacy of the space in which signs and images are traditionally inscribed, freed time in its very fluidity, That being so, the initiatory journey takes place in lived time and the feeling of sacredness becomes so to speak perceptible, or at least something approaching it. The ultimate paradox is that thanks to the temporalization specific to computer networks, a temporalization which the other media in use until now, centred on spatialization, have almost always neglected or have been unable to achieve, that our senses are able to take us via technology towards the horizon of transcendence, It is not a question of opposing temporalization and spatialization as such but of clarifying the shift taking place today, which allows us to hazard a guess at the metamorphosis taking shape.

On the threshold of the twenty-first century

Not so very long ago the arts seemed to be at one and the same time the pre-eminent expression of a civilization and, for us, a pre-eminent means of getting to know it. Palaces, tombs, churches, cathedrals, mosques, paintings, sculptures, all were 'monuments' - the etymology proves it - which conserved the collective memory and gave it a separate identity. Nowadays electronic images, of which television and computers are the major purveyors, are tending to supplant 'monumental' memory. It is not a straightforward substitution. The very nature of our idea of reality is changing together with our experience of it and together with reality itself. That is not to say that the traditional arts ('traditional' without any pejorative connotation) are doomed to disappear; they must today come to terms with the technological arts, accept to be enriched (some would say corrupted), not only by photography and cinema, but by television, video, computer graphics, reprography, holography and other techniques to come. The 'technological artists' not only have a premonition of this but are trying to respond to it by means of forms of artistic expression which are themselves in a process of change. Rising up against the attitudes that hold us back, against the threats of political, religious or economic hegemony that divide us, against abuses of powers that will soon be no more, they do then have the merit of taking into account the conditions in which we live today, by drawing on the creative virtuality of techniques, one of the most fruitful being multimedia which combines writing, voice, sound, music and data and which computer networks are spreading today throughout the world.

A prodigious process is under way which is metamorphosing millennia-old Representation into an ever more global dynamic of Reticulation. Territory is becoming less tied to maps. Under the gaze of satellites the Earth flows like a Heraclitean rider spinning round and around astronauts pursue this aetherial journey through the sky and the galaxies, abandoning us to the weight of our bodies and our habits. When will we achieve the weightlessness of spirit that we are only just starting to know through computer networks? Already we are witnessing a shift in attitudes, no doubt to a different extent and only in part according to where we live and the technology at our disposal, but one that is increasing y becoming the concern of us all.

But should we not be envisaging a radical change in our most ingrained attitudes in order to get back to the living spring of Virtuality that sustains us? 'Virtual' is common] y understood to 'mean' in the weak sense, that which is simply possible; in the strong sense, that which is already predetermined . . . and that contains all the essential conditions for its actualization. In this double meaning, 'virtuality' is linked to a shared structural and temporal schema consisting in the transition from a state A, 'possible and/or predetermined' to a state B, 'actual'. Although it might not seem so, in such a schema state B is structurally more 'real' than state A, since B proceeds from A (A ----B). This is confirmed by the temporal structure, since B concludes the sequence A---- B. Thus, what is potential (possible or predetermined) is regarded as that which is not yet realized; and that which is realized, and hence actual, is regarded as the culmination of that which is suspended in virtuality. This 'natural' disposition which David Hume denounced as arbitrary more than two centuries ago, comes from the tendency we have to confuse repetition and causality. It is not because phenomena occur in series or because our behaviour is repeated by habit that we are-justified in inferring a relationship of cause and effect. This confusion is the source of the contamination that makes us take conformity for reality.

Luckily, etymology reminds us that virtual is linked to virile, to virility. Vir is man in all his vigour. Virtue, virtus, is physical strength, and also moral strength, both of them signs of achievement and excellence. The concern is no longer to confirm the succession of two states A and B and the mechanism that serves as its protocol, but rather to highlight the power we have to generate and hence to create that is something which did not exist before start to exist. Rather than confirming causal linearity which purports to establish downstream the map of our certainties and our knowledge, 'etymological' meaning requires that we go upstream to virtuality, which is strictly speaking the dynamics of all possibilities and, no wordplay intended, the possibility of all dynamics. Of course it requires a considerable leap of the imagination to accept that knowledge, which we have for so long 'domesticated' into separate disciplines, is only one form of organization among others. The effort required of us is then on the lines of a 'cultural decolonization' which implies the 'disarmament' of the mental instruments (lexis, syntax, semantics) that have enabled us to achieve it to benefit from it. What is needed is to change outlook, change paradigm and change topic, in short initiate the process of change to come.

(33) See Vocabulaire technique et critique de la Philosophie, compiled by André Lalande, Presses universitaires de France (PUF), Paris

What I believe and am trying to express, not without difficulty, does not come down to purely and simply rejecting our habit of placing facts and reasons together in a linear sequence, in which case I would remain trapped in the traditional schema of linguistic and mental opposition that I am endeavoring to denounce; it means much more profoundly going back to the founding principle assumption. I am hard put to it to find the right word - to the energy source as it actually takes shape, and which I do not hesitate to call 'joyous virtuality'. Is it not to this that we owe universal movement of transhumance which is taking us away from the pastures or traditional logic, through new forms of artistic expression, towards the ongoing metamorphosis, the expanses of Representation that for thousands of years have known a spatial embodiment, now opening up to an emerging Temporalization? Is not the agora now giving way to cyperspace, in which exchanges become worldwide? Is it not from these networks that a new Socrates may emerge whom we may seriously call a techno-Socrates, able to command our attention in real time in the interests of a universal consciousness, beyond appeal, just as the Socrates of the agora questioned his interlocutors. without any possibility of evasion, not even through death'?

QUANTUM INFORMATION PROCESSING IN BRAIN SYSTEMS AND THE SPIRITUAL NATURE OF MANKIND

By Karl H. Pribram

Extremists

As in every human endeavor various shades of opinion emerge when an issue becomes "hot", fashionable and of general concern. Pronouncements regarding the nature of mind and especially of its conscious aspects are no exception. Daniel Dennet (1991) has humbly contributed a volume entitled 'Consciousness Explained'. In it he replaces the Cartesian theater (Shakespeare's 'Stage'?) with a tentative pluralistic set of narratives recounting our experience. Those of us who are visually and kinesthetically as well as verbally inclined might prefer to stick with Descartes and Shakespeare. Marvin Minsky (1986) has also emphasized the plurality of mental processes in his 'Society of Mind'. My question is: Have these volumes made any significant change in the basic proposition forwarded by Francis Gall at the end of the 18th century that a variety of 'faculties of mind' can be correlated with a corresponding variety of cerebral systems'? The details of correspondence, have, of course, been immensely enriched during the ensuing two centuries of research and observation. But, as to philosophy, what is new?

At the other extreme are those who espouse an 'eliminative materialism'. Folk psychology, the wisdom and folly enfolded in language and in cultural expression over the ages, is to be eliminated as scientific explanation in favor of a neural explanation. One is reminded of psychology's era of behaviorism. Stephen Stich has contributed to this endeavor a book entitled 'From Folk Psychology to Cognitive Science' (1986). Its subtitle is 'The Case Against Belief'. The argument presented in support of this extreme materialism are convoluted but seem to me to ignore the issue of scale or level. How can anyone currently ignore the fact that those who, in the former Yugoslavia as proponents of ethnic cleansing, are operating on any basis other than belief? Only differences between Orthodox, Roman Catholic and Islamic beliefs separate the protagonists. The origins and consequences of these differences in belief can be ascertained and many of them shown to be material in nature. But, just as in the word processing performed by my computer in the writing of this essay, the material instantiation of the cultural history would be as cumbersome to communicate, as would the contents of this essay in machine language. Each level of description has value determined by the use to which the description is to be put.

Scientific Dualisms: Mental and Material

Attention to the levels at which analysis is pursued helps resolve many of the hitherto untractable issues surrounding the mind/brain interface. In the ordinary world of appearances, there is no question but that human mental experiencing can be distinguished sharply from the contents of the experience. The issue has been labeled 'intentionality' (or intentional inexistence) by Franz Clemens Brentano and has given rise to inferences about the nature of reality (Brentano, 1973, Chisholm, 1960). The question is often phrased: Are my perceptions (my phenomenal experiences) the 'real', or do the contents of those perceptions make up the 'real' world? My phenomenal experiences are mental; the world as it appears to me is material. I can give primacy to my experience and become a phenomenologist, or I can give primacy to the contents of the experience and become a materialist. But I can also give primacy to neither and attest to the dual nature of the reality.

Materialism and phenomenology run into difficulty only when each attempts to deny the other. As long as only primacy is at stake, either view can be made consistent. After all, our experiences are primary, and empiricism is not inimical to a real material world. And we do appear to be experiencing something(s), so our experiences may well become organized by those real (material) something (See Bunge, 1980, for a persuasive development of this position).

However, by accepting such a moderate position with regard to mind and matter, we immediately come up against a set of dualist problems. Are the contents of perception 'really' organized by the experience of the perceiver? Is that experience in turn organized by brain function, sensory input, and the energies impinging on the senses? Would a complete description of brain function of an organism also be a description of the experience of that organism? If so, are not the material descriptions of brain, senses, and energies sufficient? Or at least do the descriptions of experience add anything to the material descriptions? Cannot the inverse be equally true? What do the descriptions of brain, senses, and energies materially add to what we so richly experience'?

I believe that today there are answers to those questions where only a few years ago there were none. These answers come from 'unpacking' conceptual confusions and demonstrating where each conceptualization captures a part of the truthful whole.

A semantic analysis shows that descriptors of brain, senses, and energy sources are derived from an analysis of experience into components. The components are organismic and environmental (biological and physical or social), and each component can be subdivided further into subcomponents until the quantum and nuclear levels of analysis are reached. This procedure of analysis downward in a hierarchy of systems is the ordinary way of descriptive science. Within systems, causes and effects are traced. When discrepancies are found, statistical principles are adduced and probabilities invoked. Scientists have become adept and comfortable with such procedures.

Mental language stems from different considerations. As in the case of descriptive science, mental terms take their origin in experience. Now, however, experience is validated consensually. Experience in one sensory mode is compared with that obtained in another. Then validation proceeds by comparison of one's experience with that of another. A little girl points to a horse. Up to now, her mother has allowed her to say 'cow' whenever any animal is pointed to. But the time has come to be more precise, and the experience of horse becomes validly different from that of a cow. Mental language is derived from such upward validations in a hierarchy of systems.

Elsewhere I detail the differences in scientific approach that this upward or outward look entails (Pribram, 1965). It is certainly not limited to psychology. When Albert Einstein enunciated his special and general theories of relativity, he was looking upward in the set of hierarchically arranged physical systems. The resultant relativistic views are as applicable to mental conceptualizations as they are to physical ones. It is these relativisms that existentialists and phenomenologists constantly struggle to formulate into some coherent principles. My own belief is that they will be successful only to the extent that they develop the techniques of structural analysis (reconstruction). But structured analyses often depend on enactment to clarify the complexities involved. Abhorrent as the computer and other engineering devices may be to philosophers and psychologists of the existential-phenomenal persuasion, these tools may turn out to be of great service to their mode of inquiry.

If the above analysis is correct, then a dualism of sorts can be entertained as valid. First, however, let me provide a cautionary note. This form of dualism is concerned with the everyday domain of appearances--of ordinary experiences. Commencing with such ordinary experiences, two modes of conceptualization have developed. One mode operated downward in a hierarchy of systems, analyzing experience into components and establishing hierarchical and cause-effect relationships between these components. The other operated upward toward other organisms to attain consensual validation of experiences by comparing and sharing them.

Thus two mirror images--two optical isomers, as it were--are constructed from experience: One we call material and the other mental. Just as optical isomers, although they have identical components and arrangement in chemistry have differing biological properties, so the mental and material conceptualizations have different properties even though they initially arise from the self-same experiences.

I suggest that this is the origin of dualism and accounts for it. The duality expressed is of conceptual procedures not of any basic duality in nature. As we will see there are other dualities that are more basic, but these are not the ones that have become the staple of those arguing for dualism.

Thus, strictly speaking, mentalism and materialism imply each other, because there would be no need for mentalism if there were no materialism. There is no up without a down. Further, Sperry (1980) and Searle (1984) attempted to limit their mentalism to those structures that are organized by and, in turn, organize the brain. But it is not clear whether

they would be willing to go to an epistemological limit that holds that mind interacts with the elementary components making up the brain. Intuition regarding biological roots of mental it y is certainly accurate. To confuse. the analogy of the computer with the historically based homologies that have given rise to psychological processes is akin to calling a whale a fish. By the same token, however, Sperry and Searle are adamantly opposed to an 'independent existence of conscious mind apart from the functioning brain' (Sperry, 1980, p. 195); their mentalism does not stretch to cover the very essence of what motivates mentalism in the hands of those who oppose it to materialism; that is, the primacy and independence of mental structures.

What Computers Can Tell Us

Within the above caveat, let us look at the usefulness for an analysis of the mind/brain connection of computers, programs, and the processing of information in some detail because in many respects these artifacts so clearly portray some of the problems involved in the mind/brain issue. As noted (see e.g. Searle, 1984), the computer is not a brain, but its programs are constructed by people who do have brains. Nonetheless, computers and their programs provide a useful metaphor in the analysis of the mind/brain issue in which the distinction between brain, mind, and spirit can be seen as similar to the distinction between machine (hardware), low-level programs (e. g., operating systems), and high-level programs (e.g., word processing packages). Low-level programs such as machines languages and assemblers are not only idiosyncratic to particular types of computer hardware, but there is also considerable similarity between the logic of these languages and the logic operations of the machines in which they operate. In a similar vein, to some extent perceptual processes can be expected to share some similarity to brain processes. On to other hand, high-level languages such a Fortran, Algol, and Pascal are more universal in their application, and there is less obvious similarity between their implicit logic and the logic of machines. At the highest level, in languages such as English, with which I address my computer in order to use it as a word processor, the relation between the logos of English (word, concept, logic) and that of the machine is still more remote. However, English relates me to a sizable chunk of the human social order. To complete the analogy, humanity's spiritual nature strives to make contact with more encompassing orders whether they be social, physical, cosmological, or symbolic.

Understanding how computer programs are composed also helps to tease apart some of the issues involved in the 'identity' approach in dealing with the mind/brain relationship. Because our introspections provide no apparent connection to the functions of the neural tissues that comprise the brain, it has not been easy to understand what theorists are talking about when they claim that mental and brain processes are identical. Now, because of the computer/program analogy, we can suggest that what is common to a mental operation and the brain 'wetware' in which the operation is realized, is some order that remains invariant across transformations. The terms information (in the brain and cognitive sciences) and structure (in linguistics and in music) are most commonly used to describe such identities across transformations. Order invariance across transformations is not limited to computers

and computer programming. In music we recognize a Beethoven sonata or a Berlioz symphony irrespective of whether it is presented to us as a score on sheets of paper, in a live concert, over our high fidelity music system, or even in our automobiles when distorted and muffled by noise and poor reproduction. The information (the form within) and the structure (arrangement) is recognizable in many embodiments. The materials that make the embodiments possible differ considerably from each other, but these differences are not part of the essential property of the musical form. In this sense, the identity approach to the mind/brain relationship, despite the realism of its embodiments, partakes of Platonic universals, that is, ideal orderings that are liable to becoming flawed in their realization.

In the construction of computer languages (by humans) we gain insight into how information or structure is realized in a machine. The essence of biological as well as of computational hierarchies is that higher levels of organization take control over, as well as being controlled by, lower levels. Such reciprocal causation is ubiquitous in living systems: Thus, the level of tissue carbon dioxide not only controls the neural respiratory mechanism but is controlled by it. Discovered originally as a regulatory principle that maintains a constant environment, reciprocal causation is termed homeostasis. Research over the 'past few decades has established that such (negative) feedback mechanisms are ubiquitous, involving sensory, motor, and all sorts of central processes. When feedback organizations are hooked up into parallel arrays, they become feedforward control mechanisms that operate much as do the words (of bit and byte length) in computer languages (Miller et al., 1960; Pribram, 1971).

Equally important, programming allows an analysis to be made of the evolution of linguistic tools that relate the various levels of programming languages. Digital computers with binary logic require a low-level language (coded in the numerals 0 or 1) that sets a series of binary switches. At the next level, switch settings can be grouped so that binary digits (bits) are converted into a more complex code consisting of bytes, each of which is given an alphanumerical label. Thus, for example, the switch setting 001 becomes 1, the setting 010 becomes 2, and the setting 100 becomes 4.

Given that 000 is O, there are now eight possible combinations, each of which is an octal byte. This process is repeated at the next level by grouping bytes into recognizable words. Thus 1734 becomes ADD; 2051 becomes SKIP, and so forth. In high-level languages, groups of words are integrated into whole routines that be executed by one command,

It is likely that some type of hierarchical integration is involved in relating mental processes to the brain. Sensory mechanisms transduce patterns of physical energy into patterns of neural energy. Because sensory receptors such as the retina and the cochlea operate in an analog rather than a digital mode, the transduction is considerably more complex than the coding operations described above. Nonetheless, much of neurophysiological investigation is concerned with discovering the correspondence between the pattern of physical input and the pattern of neural response. As more complex inputs are considered, the issue becomes one of comparing the physically determined patterns with subjective experience (psychophysics) and recording the pattern of response of sensory stations in the brain.

These comparisons have shown that a number of transformations occur between sensory receptor surfaces and the brain cortex. The transformations are expressed mathematically as transfer functions. When the transfer functions reflect identical patterns at the input and output of a sensory station, the patterns are considered to be geometrically isomorphic (i so means same; morph means form), that is, of the same form. When the transfer functions are linear (i. e., superposable and invertible, reversible), the patterns are considered to be secondarily y or algebraically y isomorphic (Shepard & Chipman, 1970). Thus, as in the case of computer programming, levels are due to transformations that progressively alter the form of the pattern while they maintain intact some basic order, an informational structure.

What I propose, therefore, is an isonomic structural 'monism', which states that the truly basic components of the universe are neither material or mental, but neutral to this dichotomy. The dematerialization of energy in modern physics (which I will review in the next section), supports a 'neutral monism' (James, 1909; Russell, 1948). Critical philosophers (e.g. Herbert Feigl, 1960), who were steeped in linguistic analysis, developed a monistic view by suggesting that the 'mental' and 'material' are simply different ways of talking about the same processes. Thus 'mind' and 'brain' come to stand for separate linguistic systems, covering different aspects of a basic commonality. The problem has been to find a neutral language to describe the commonality without being either mental or material in its connotations.

I have taken this 'dual aspects' view a step further by proposing that each aspect not only is characterized linguistically but, in fact, is a separate 'realization' or 'embodiment' (Pribram, 1971). As noted, I have further proposed that what becomes embodied is informational 'structure'. Thus, in essence I have stood the critical philosopher's approach on its head: The enduring 'neutral' component of the universe is informational structure, the negentropic organization of energy. In a sense, this structure can be characterized as linguistic--mathematical, musical, cultural, and so on. Dual aspects become dual realizations --which, in fact, may be multiple--of the fundamental informational structure. Thus, a symphony can be realized in the playing at a concert, in the musical score, on a record or on a tape, and thence through a high-fidelity audio system at home.

Mind and brain stand for two such classes of realization, each achieved, as described earlier, by proceeding in a different direction in the hierarchy of conceptual and realized systems. Both mental phenomena and material objects are realizations and therefore realities. Both classes of reality are constructions from underlying 'structures', which it is the task of science to specify in as neutral a language as possible (neutral, i.e., with respect to connotations that would suggest that the 'structures' belong in one or the other class). I note elsewhere the relationship of such a constructional realism to critical realism, pragmatism, and neo-Kantian rationalism (Pribram, 1971).

There is thus an important difference between a constructional realism such as I propose and materialist, mentalist, dualist, and triadic interactionisms. In a constructional scheme the precise place of brain mechanisms can be specified. There is no global 'mind' that has to make mysterious contact with global 'brain'. Many mysteries are still there-to name only one, for example, how emergents come about and why they are so utterly different from their substrate. But issues become scientific and manageable within the broader context of philosophic enquiry.

The World of Appearance and the World of Potentiality

Holding to structural isonomy (obeying related laws) with regard to the mind/brain issue involves specifying what is the focus of the issue. Unless something remains constant across all the coding operations that convert English to binary machine code and back to English, my word processing procedures would not work. Isonomy implies reciprocal stepwise causation among structural levels. Contrary to the usually held identity position, isonomy does not necessarily mean geometrical or even algebraic isomorphism. Transformations, coding operations, occur that hierarchically relate levels of complexity with one another. A level is defined by the fact that its description, that is, its code, is in some nontrivial sense more efficient (i. e., requires less work, less expenditure of energy) than use of the code of the components that Compose it. In the case of the word processor, the coding is arbitrary, and the arbitrariness is stored on a diskette and copy-righted. In the case of the mind/brain relationship, the nature of the coding operations is more universal and the efforts of two centuries of psychophysical, neuropsychological, and cognitive research have provided knowledge concerning at least some of the coding operations involved.

I am belaboring these findings of scientific research to indicate that, contrary to what some philosophers hold (see, e.g. Dewan et al., 1976), they have relevance to philosophical issues. If the mind/brain problem arises from a distinction between the mental and the material and we find that at a certain level of analysis we no longer can clearly make such a separation, then the very assumptions upon which the issue is joined may be found wanting.

Levels of analysis thus concern the fundamental assumption that has given rise to the mind/brain problem: Mental phenomena and the material universe must, in some essential fashion, differ from each other. As we have seen, in the ordinary domain of appearances, at the Euclidean-Newtonian level of analysis, this view is certainly tenable. But at the levels of the macro- and microphysical universes, dualism becomes awkward. Niels Bohr's complementary and Werner Heisenberg's uncertainty principle emphasize the importance of the observer in any understanding of what presumably is observed (Bohr, 1966; Heisenberg, 1959). Eugene P. Wigner (1969) stated the issue succinctly: Modern microphysics and microphysics no longer deal with relations among observable but only with relations among observations.

An objection can be entered that such difficulties of distinguishing observable from observations encountered today by physicists are temporary, superficial, and of no concern to philosophers interested in the eternal verities. But that is not the message these thoughtful pioneers in physics are attempting to convey. They have been exploring universes where the everyday distinction between material and mental becomes disturbingly untenable at a very fundamental level. As I proceed, I shall tender some explanations that may help account for their views.

The dematerialization of energy can be traced in some sense to earlier formulations. For instance, physics was conceptually understandable in James Clerk Maxwell's day when light waves were propagated in the 'ether'. But then physicists did away with the 'ether'. Still, they did not rid themselves of Maxwell's wave equations or the more recent ones of Erwin Schroedinger (1928) or Louis Victor Prince de Broglie (1964). One readily can conceptualize waves traveling in a medium, such as when sound waves travel in air, but what can be the meaning of light or other electromagnetic waves 'traveling' in a vacuum? Currently physicists are beginning to fill that vacuum with dense concentrations of massless bosons, zero point energy and quantum potential for doing work when interfaced with matter. It is this potential that, I propose, is neutral to the mental-material duality.

In science, such potentials are defined in terms of the actual or possible work that is necessary for realization to occur and are measured as change in terms of energy. Thus, multiple realization imply a neutral monism in which the neutral essence, the potential for realization, is energy. And, as stated in the second law of thermodynamics, energy is entropic, that is, it can have structure. Energy is not material, only transformable into matter. It is measured by the amount of work that can be accomplished by using it and the efficiency of its use depends on its organization as measured by its entropy. The invention of the vacuum tube and subsequent devices have shown that properly configured minute amounts of energy can control large expenditures and that these minute organizations provide 'information', that is, they inform and organize energy. Measures of information and entropy thus were seen as related (see, e.g., Brillouin, 1962; Von Weizsacker, 1974). Computers were constructed to process information, and programs were written to organize the operations of computers. Is the information contained in a program 'material' or 'mental'? If it is either, what then of the information in a book? Or the entropy that describes the behavior of heat engine or of a warm-blooded mammal? Clearly, we have come to the limit of usefulness of a distinction between the material and the mental.

Heisenberg (1959) developed a matrix approach to understanding the organization of energy (and momentum, i.e., inertia). Currently, this approach is used in s-matrix, bootstrap theories of quantum and nuclear physics by Henry Stapp (1965) and Geoffrey Chew (1966). These investigators (among others, Dirac, 1951) have pointed out that measures of energy and momentum are related to measures of location in space-time by way of a Fourier transform. The Fourier theorem states that any pattern of organization can be analyzed into, and represented by a series of regular waveforms of different amplitudes and frequencies and phase relations. These regular waveforms can in turn be superimposed, convolved, with one another and, by way of the inverse Fourier procedure, can be retransformed to obtain correlations in the original space-time configuration. Thus, the Fourier transform of a set of patterns displays a spectral organization that is, of course, different from that which is

displayed after the inverse Fourier transform has again converted the pattern into the spacetime order.

In terms of the proposition put forward by Dirac, Stapp and Chew, this means that the organization of energy and momentum is considerably different from the space-time organization of our ordinary perceptions that can be expressed in Euclidean, Cartesian, and Newtonian terms. David Bohm (1971, 1973, 1976) has identified these nonclassical organizations of energy potentials as 'implicate', that is, enfolded, and has used the hologram as an example of one such enfolded order. Because Bohm has concerned himself with additional unspecified implications, I will refer to this as a first implicate or implex order. Dennis Gabor (1946, 1948), the inventor of the hologram, based his discovery on the fact that one can store on a photographic film, interference patterns of waveforms produced by the reflection or refraction of light from an object and reconstruct from such a film the image of the object. It is probably no accident that holograms were a mathematical invention (by Dennis Gabor) that used a form of mathematics the integral calculus, invented by Gottfried Wilhelm Leibniz, who also came to a vision of the implex order. Leibniz's monadology (1714/1951) is holographic; his monads are distributed, windowless forms each of which is representative of the whole. Substitute the term lensless-for windowless, and the description of a monad and a hologram is identical. Today the description of the enfolded organization of the stored potential for reconstruction is related to the unfolded space-time description of the object by a Fourier transform.

The Fourier theorem has also played an important role in the recent discoveries in the brain sciences. In the late 1960s, several groups of investigators found that they could explain their findings in visual research when they realized that their results indicated that encoding of spatial patterns in the visual system involved what they called spatial frequency. This term describes the spectral domain that results when a Fourier transform is performed on space-time. Fergus Campbell and John Robson (1968) of Cambridge University discovered unexpected regularities in their data: Responses to gratings of different widths and spacings adapted not only to the particular grating shown but also at other data points. These additional adaptations could be understood by describing the gratings as composed of regular waveforms with a given frequency and the regularities in terms of harmonics. The spectral frequency was determined by the spacings of the grating, and thus the term spatial frequency. Spatial and temporal frequencies are related of course: Scanning by a steadily moving beam would describe the grating's temporal frequency. Physicists therefore use the term wave number to denote the purely frequency, spectral form of description of patterns.

What this means is that the optical image is decomposed into its Fourier components: regular waveforms of different frequencies and amplitudes. Cells in the visual system respond to one or another of these components and thus, in aggregate, comprise an image processing filter or resonator that has characteristics similar to the photographic filter comprising a hologram, from which images can be reconstructed by implementing the inverse transform.

There are, however, important differences between ordinary photographic holograms and the visual nervous system. Ordinary holograms are composed by a global Fourier transform that distributes the information contained in a space-time image throughout the transform domain. In the visual nervous system, distribution is limited anatomically to the input channeled to a particular cortical cell. Nonetheless, there are holographic techniques that use similar 'patch' or multiplex constructions. Bracewell (1965) at Stanford University pioneered these techniques in radioastronomy by stripping together the holographic transformations of limited sectors of the heavens as viewed by radiotelescope. When the inverse transform is applied, space-time images of the whole composite can be viewed in three dimensions.

Furthermore, the transform that best describes the process in the visual system is a Gabor, not a Fourier. The Gabor transform (Gabor 1946, 1948; Pribram and Carlton, 1987; Daugman, 1985; Marcelja, 1980) is formed by placing a Gaussian envelope on the otherwise unlimited Fourier transform. This is another way of stating that the transformation is patchlike and not global, and gives mathematical precision to the limits involved.

Finally, the arrangement of the visual channels and the cortical cells is not haphazard with regard to one another. A clear retinotopic to cortical spatial arrangement is maintained. Thus the gross grain of the visual filter determines space-time coordinates, whereas its fine-grain describes the Fourier components.

What advantage is gained by this fine-grain holographic-like organization? Recall that in the transform domain correlations among patterns are readily performed. This is why the Fast Fourier Transform (FFT) as performed by computer is such a powerful tool in statistical analysis and in computerized tomography (CT scans). The brain is an excellent correlator by virtue of its finegrain processing potential.

The dual properties of an enfolded fine-grain (technically, the synaptodentritic receptive field organization) and a gross-grain space-time organization applies to other sense modalities as well, although the experimental evidence is not as complete. Georg von Békésy (1967) performed critical studies in the auditory and someesthetic modalities, Walter Freeman (1960) conducted studies in the olfactory, King, Xie, Zheng and Pribram (1994) in the somatosensory, and Pribram, Sharafat, and Beekman (1984) have shown that cells in the sensorimotor cortex are tuned to specific frequencies of movement. At the same time, in all these sensory systems the spatial organization of the receptor surface is topographically represented in the gross-grain arrangement of the cortical cells that receive the sensory input.

In summary, there is good evidence that another class of orders lies behind the ordinary classical level of organization we ordinarily perceive and which can be described in Euclidean and Newtonian terms and mapped in Cartesian space-time coordinates. The other class of orders is constituted of fine-grain distributed organizations described as potential because of the radical changes that occur in the transformational process of realization. When a potential is realized, information (the form within) becomes unfolded into its ordinary space-time appearance; in the other direction, the transformation enfolds and

distributes the information as this is done by the holographic process. Because work is involved in transforming, descriptions in terms of energy are suitable, and as the structure of information is what is transformed, descriptions in terms of entropy (and negentropy) are also suitable. Thus on the one hand there are enfolded potential orders, on the other there are unfolded orders manifested in space-time.

The point was made earlier in this essay that the dualism of mental versus material holds only for the ordinary world of appearances-the world described in Euclidean geometry and Newtonian mechanics. An explanation of dualism was given in terms of procedural difference in approaching the hierarchy of systems that can be discerned in this world of appearances. This explanation was developed into a theory, a constructional realism. But it was also stated that certain questions raised by a more classical dualistic position were left unanswered by the explanations given in terms of an identity position.

Two issues can be discerned: 1) What is it that remains identical in the various levels of the hierarchy of programs of compositions? and 2) Is the correspondence between machine language (program or musical notation) and the machine or instrument's operation an identity or a duality? I believe the answer to both the questions hinges on whether one concentrates on the order (form, organization) or the embodiments in which these orders become instantiated (Pribram, 1986; 1993).

There is a difference between surface structures of different grains which become trans-formed and the deeper isonomy which in-forms the transformations, Transformations are necessary to material and mental 'instantiations' -- Plato's particular appearances -- of the ideal in-forms: the instantiation of Beethoven's 9th Symphony is transformed from composition (a mental operation) to score (a material embodiment) to performance (more mental than material) to recording on compact disc (more material than mental) to the sensory and brain processes (material) that make for appreciative listening (mental). But the symphony as symphony remains recognizable as Beethoven's creative composition over the centuries of performances, recordings and listening.

Instantiation depend on transformations among orders. What remains invariant across all instantiation is 'in-formation', the form within. Surprisingly, according to this analysis, it is a Platonic 'idealism' that motivates the information revolution ('information processing' approaches in cognitive science) and distinguishes it from the materialism of the industrial revolution. Further, as in-formation is neither material nor mental, a scientific pragmatism akin to that practiced by Pythagoreans, displaces mentalism and dualism as well as materialism. At a minimum the tension between idealism (the potential), and realism (the appearance) which characterized the dialogue between Plato and Aristotle, will replace that between mentalism and materialism.

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VALUES AND THE QUANTUM CONCEPTION OF MAN

By Henry P. Stapp

1. Introduction

Science has enriched our lives in many ways. It has lightened the burden of dreary tasks and enhanced our creative capacities. It has conquered diseases and extended our productive years. It has broadened our understanding of the universe about us and our place within it. Yet, while conferring these benefits, it has created the problems of crowding, pollution, alienation, and even the threat of self-extinction. To resolve these problems a moral base is needed. However, science has also largely destroyed, at least among the educated, the traditional foundation of morality, namely ancient beliefs about our link to the power that created both ourselves and the world about us. In particular, classical mechanics, which for centuries was our basic science, transformed the impulse that forms and sustains the world into a primordial burst of energy that set the universe in motion, but then lapsed into total passivity. Each man became, in this classical conception, a mechanical and microscopically controlled automata whose every action was preordained before he was born. Gone, or diminished, is the idea that we bear responsibility for our actions, for we were taught by science to see ourselves not as agents of a creative power, free to choose from among options, but rather as mechanical devices running on automatic, ruled by forces beyond our control. Science, having thus undermined the traditional foundation of morality, seemed to offer no adequate replacement.

In its original seventeenth-century form classical mechanics did not wholly eliminate the capacity of spirit and mind to influence the course of human actions. Thoughts were allowed to interact with brains and, through them, to affect the motions of our bodies. But by the beginning of the present century both thoughts and gods alike had, according to science, been rendered impotent: they could do no more than passively observe the mechanically generated course of physical events. The clarity and consistency of this conception of universe seemed so perfect, and the power of the idea to produce both beguiling new products and stable nations seemed so strong, that its survival seemed assured. Yet these concepts are fundamental y incorrect. They are unable to account for the detailed behavior of various materials, and by the 1930's this mechanical conception of nature had been replaced at the fundamental level by something profoundly different: quantum mechanics.

The enormous conceptual gulf between quantum mechanics and classical mechanics has blocked the dissemination of this radically new conception of man and nature into the intellectual community at large. Hence its impact upon moral philosophy has been virtually nil. Yet one can scarcely imagine that the world view that had served as the ideological basis of the industrial and early scientific age can become so thoroughly repudiated without its explosive impact on our conception of ourselves eventually asserting itself. Indeed, the

greatest remaining gift of science to man may be not a still greater mastery of our physical environment, but rather an unraveling of the mystery of our own beingness, and the consequent rise of a rational system of values based on a more valid self image.

In this contribution to the symposium I shall describe what appears to me to be the impact upon moral issues of the quantum revolution in science. Because these questions appeared to have no immediate professional relevance to scientists, the issues have not yet been widely discussed by those best equipt to understand them. I shall therefore endeavour to describe the situation in a way that will be clear to nonscientists, who will need to see beyond the technicalities, and also to physicist, who will want to see, in some form, the technical basis.

2. **From Atom to Man**

Quantum mechanics was originally a theory about atoms and their constituents: it was about our observations on systems composed of electrons, photons, and atomic nuclei. However, these are the same elements from which most materials are made, including the tissues and other components of our brains and bodies. Consequently, quantum mechanics is not merely a theory about atoms: it is our fundamental physical theory about the detailed behavior of all material things, including our own bodies and brains. Yet the relationship of quantum mechanics to man goes far beyond the fact that our bodies and brains are composed of atoms. In order to construct a rationally coherent theory of atomic phenomena Niels Bohr found it necessary to bring human observers into the theory: classically describable perceptions of human observers became the basic realities of the theory, and the mathematical formalism was construed not as the description of the actual form or structure of an externally existing reality, but rather as a scheme that scientists and engineers could use to make predictions about the structure of their experiences pertaining to a world that was given no definite actual form independently of our experience of it. This radical move was fiercely opposed by Einstein, and many other eminent physicists of that time. But they could come up with no satisfactory alternative.

The issue was subsequently re-opened, and logically acceptable alternatives to the Bohr interpretation are now available. But the fact remains that any theory that fits the empirical facts must accept as elements either perceptions of human observers, or other elements that, like human perceptions, link together sequences of classically describable states as *alternative* possibilities, even though the basic quantum mechanical law of motion, the Schroedinger equation, generates no such *either-or* decomposition.

There is no empirical evidence supporting the notion that there is anything other than consciousness, or mind, that makes this separation into *alternative* possibilities, and chooses between them. Moreover, if something else is brought in to do the job, then it is a 'stand in' for consciousness, in the sense that consciousness is all that is needed; and if something else plays this role, then a mystery is generated: Why does consciousness exist at all? For if mind does not effect the choices that are needed to complete the quantum theoretical conception of nature, then thoughts appear to have no function at all in nature: they become superfluous.

Bohr adopted a very parsimonious position: he brought in only the minimum structure needed to fit the empirical facts. He introduced no extra physical paraphernalia to define the alternatives and choose between them. He let our perceptions themselves specify what has happened. The introduction of our perceptions of the physical world into the basic physical theory, though considered unorthodox during the twenties, can hardly be deemed irrational. For scientists rarely deny the existence of our perceptions of the world. Bohr merely introduced into our basic scientific theory something already known to exist, and, in fact, the very thing whose existence is most certain to us, and whose structure is precisely thing that our science needs in the end to explain.

Yet Bohr's move seemed retrograde at the time. For the tremendous success of science was widely perceived to be a vindication of the wisdom of excluding spirit and mind from our scientific conception of the physical world, along with religious dogmas and myths.

Bohr proceeded very cautiously with the re-introduction of mind into science. Keeping the connection to the actual practices of physicists in the fore, he and his colleagues, principally Heisenberg, Pauli, and Born, formulated quantum theory as a set of rules that allowed scientists to calculate the probabilities that perceptions conforming to classically describable specifications would occur under classically describable conditions.

Complications pertaining to 'the living tissues in the bodies and brains of the human observers were kept out of the theory by focussing on the classically describable specifications themselves, without worrying about how we know whether or not these conditions are actually met in real cases. However, the pragmatic approach rests squarely upon our being able to decide, in practice, whether such specifications are met or not.

Bohr could not evade this reference to our perceptions by postulating the existence of some other classical level of beingness. For to admit the existence of some other level of reality would contradict his basic claim, which was that quantum theory, in the form he proposed, was complete. Admitting the existence of a classical level of physical reality would require a whole new level of theoretical machinery. This he avoided by allowing our perceptions, already known to exist, to be the things that were the subject of his classically describable specifications.

Although this pragmatic Copenhagen approach was efficient and practical in the domain of atomic physics, it provided no detailed idea of how nature managed to make the quantum rules work. This lacuna was of no great concern to practical-minded atomic scientists, but it hindered efforts to extend the scope of the theory to other domains, such as cosmology and biology, Heisenberg, von Neumann, and others improved the theory in this respect by providing a theory for how nature could work in a way that would make the empirically validated rules come out true.

The key element of this ontology was the concept of 'events'. Although there were differences among various authors regarding fine points, the simplest formulation of the idea is that the probability wave of the earlier pragmatic interpretation, which evolves in accordance with a fixed deterministic equation of motion. The Schroedinger equation, is elevated in status from a subjective entity that scientists use to compute probabilities

pertaining to their classically describable perceptions of the world, to an objective property of nature herself. This objective property is tied to the idea of 'events': the probability wave is considered to define an objective tendency for an actual event to occur. The occurrence of any such actual event will reduce some of the uncertainties that had existed in nature prior to the occurrence of this event, and this reduction in these uncertainties will be reflected in a new set of objective tendencies for the next event, and hence a sudden change in the probability wave. The fact that the probability wave specifies only 'objective tendencies' for the next event, not definite certainties, means that the particular event that will occur next is not uniquely determined beforehand: the choice from among the allowed possibilities is a random event, with the statistical weights of the various possibilities being specified by the probability wave.

This model of nature can be set up so as to retreat again from the idea of bringing mind into physical theory. That was Heisenberg's tack. But this brings up the same problem as before: it leaves mind with nothing to do. However, there is no rational reason to exclude from physical theory something that we know exists, and that seems to do something, and then to bring in, instead, something else, unknown to us, to do exactly what the known thing seems to do, merely because in an earlier *and now deposed* theory the known thing could not do what it seemed to do, namely make real choices between open and available possibilities.

Von Neumann brought the brains of the observers explicitly into the description of nature, and stressed the possibility of identifying the 'choosing events', needed by quantum theory, with those brain events that can be considered to be representations, within quantum mechanically described brains, of mental events. This approach constitutes, essentially, an ontological version of the Bohr approach, in that the mental events, which are what specifies what actually happens, are tied directly to the quantum formalism without the explicit introduction of any intermediate classical level or reality.

This von Neumann approach is not the only ontological possibility. But it can, I believe, be rightfully regarded as the most orthodox of the quantum ontologies, for two reasons. The first is that it is the ontology closest in spirit to Bohr's approach: no extra classical level intervenes between the quantum level of description and the classically describable perceptions, and no profusion of extra unobserved worlds is brought in. The idea that one should introduce into physics unverifiable classical levels of physical reality is exactly the idea that Bohr fought so strongly against. The second reason is that when the other quantum ontologies are considered, their predictions are considered unorthodox to the extent that the extra structure they introduce produces a deviation from the predictions obtained without introducing the extra structure. This von Neumann ontology is the one that leaves out all the excess structure.

I attribute this ontology to von Neumann because his close friend and colleague Eugene Wigner did so in a later work, in which he extols and further describes it. Von Neumann (1932) describes this ontology briefly, but his definite preference for it is not clearly spelled out in his own work. Perhaps this approach would be better called the von Neumann-Wigner ontology, but Wigner later rejected it, for reasons I deem insufficient.

Yet what has all this discussion about man and nature to do with values? The answer lies in the central importance to moral philosophy of our beliefs about such things.

3. **The Importance of Beliefs**

If a person truly believes that doing some act will cause him to suffer the flames of eternal damnation, then he will probably be disinclined to do it. If he has no such belief, but believes himself to be a rotten worthless being who acts only to benefit himself, regardless of the consequences to others, then he will probably act in this way and thereby become what he believes himself to be. If, on the other hand, he believes himself to be made of finer stuff, and the product of a worthy lineage of high-minded souls, then he may be inclined to measure up to lofty ideals, and thereby to extend the lineage. What one believes about himself, and his connection to the rest of the universe, exerts a powerful influence on one's behaviour, and it is the whole basis for rational action.

Science is a principal source of rationally held beliefs. If one believes himself to be a mechanically generated product of his genetic make-up and a mechanically predetermined physical environment then he probably will be far less able to release his full creative energy than if he believe himself to be a facet of a universal impulse in nature that exploits the indeterminateness of the physical world to actualize intentions and generate meaning. Moreover, from a rationally based perception of a deep-seated wholeness of nature there can flow both more compassion and less alienation.

4. **The Nature of Man**

What is the quantum mechanical conception of the nature of man?

By the quantum mechanical conception I shall mean, for the reasons given above, the von Neumann conception. I have in my book and elsewhere (Stapp, 1993, 1995a-c) filled in some of the details of this conception in a way that seems both natural and compatible with the empirical evidence from neuroscience and psychology. The key point is that each human conscious event is represented in this conception of nature by a quantum event that actualizes *an extended structure* in the brain of some human being. This event selects, and brings into being, one template for action from among many that, according to the quantum mechanical laws, were all physically possible just prior to that event. Each such template is a coordinated plan of action for this brain and the hod y it controls.

In any physical theory of man a primary job of man's brain must be to form such templates for action. The essential difference between the classical and quantum conceptions is that in the classical conception the brain must come up --quickly in an emergency situation-- with exactly *one* template for action, which will direct the unfolding of some coherent action, whereas in the quantum case, because of Heisenberg's indeterminacy principle, the evolution in accordance with the Schroedinger equation will generate a host of alternative possible templates for action. Thus if a situation calling for action presents itself to an alert person, his brain will generate *one* template for action, according to the classical

conception of nature, but many alternative possible templates for action according to the quantum conception. It is this profusion of possible templates for action, and consequent actions, that is resolved in the von Neumann ontology by the occurrence of an 'event', which selects one of the possibilities and eliminates all the others. This event is a mental event that is represented in the quantum mechanical conception of the physical world by a sudden change in the form of the probability wave, namely by a jump to a form that has all of the probability concentrated on the branch of the probability wave that represents this chosen course of action, and, correspondingly, a null probability assigned to all of the alternative possible branches. The actualized template for action is an extended physical structure in the brain, and it is supposed to embody all of the structural information that is contained in the mental event. Thus the mental and physical events can be considered to be two aspects of the same thing. Each event represents from the physical perspective provided by quantum mechanics a bona fide free choice from among open and available options.

5. Chance, Choice, and Meaning

This quantum conception of man breaks the bondage of an iron-handed mechanical determinism. Man becomes an aspect of the process by which nature uses the latitude, or freedom, expressed by the Heisenberg indeterminacy principle to inject form and structure into the universe. In the classical conception of nature all freedom to choose was concentrated at the moment of the creation of the universe, and hence none was reserved for later use. But quantum theory transferee this freedom to later times, and von Neumann's conception shifts some of it to our thoughts: our minds become endowed with some of the power to act freely that in classical mechanics was the prerogative of God alone.

Our choices are not secluded from meaning. Each choice is the expression of an intention. It arises within a context, and it initiates an action designed to promote certain values. The intention of the action and values it serves are integral parts of the felt act of choosing.

These qualities of the quantum event can be contrasted with the meaninglessness of random events that might be imagined to occur at some microscopic level. There it is impossible to embody in the physical structure actualized by the event any representation of intention or value that transcends the momentary situation. But the events of the von Neumann conception, which actualize extended physical structures that are imbedded in the interpretive mechanism provided by the brain and body, to embody intention, values, and meaning, all of which are felt at the mental pole.

A healthy brain is designed and conditioned to produce the actions most likely to serve the needs and values of the person, as judged from the perspective of that person. Of course, there are always uncertainties in our assessment of the physical situation, and fluctuations in the biological computing machinery. Hence different parallel brain calculations of the best course of action can come up with different conclusions. In the quantum ontology these parallel computations are all performed simultaneously, and the various options are all presented. The statistical weight assigned to each option is essentially the number of parallel classical computations that lead to that option. The simultaneous

availability of all the options can be regarded as an expression of the freedom that is represented by the quantum indeterminateness of the physical situation. This indeterminacy makes the quantum choice a bona fide free choice, yet a choice that has only the latitude allowed by the underlying physical indeterminacy. The choice is thus at the same time both a free choice and yet, statistically speaking, in terms of the entire ensemble of weighted possible choices, also the unique best choice: this ensemble is roughly the statistical ensemble of computed best actions, given the indeterminateness of both the external situation and the internal computational machinery.

These choices are not blind choices, as they would be if they occurred at the microscopic level. For they are choices between options that project into the future actions that embody intentions based on our values. Our choices constitute value-laden intentions, and are thus endowed with meaning: they embody both the mechanically represented personal attributes arising from genes and education, and a freedom that transcends the mechanical,

This image of man is far more inspiring and liberating than the dreary picture painted by classical mechanics. Man becomes a partner in the control of his non-predetermined destiny, and an integral part of nature's process of infusing structure and meaning into the universe. He is an aspect of the power to freely create that classical mechanics reserved for God alone.

Beyond its re-instatement of freedom and meaning the quantum conception unveils a still deeper truth. This arises from an aspect of quantum mechanics not yet touched upon here, namely the deep-level of connectedness of spatially separated physical entities. Once two entities have interacted they become intrinsically intertwined in a way that is not physically apparent, and that moreover defies comprehension within the way of thinking that underlies classical mechanics and our common-sense understanding of nature. Yet it is entailed by quantum mechanics, and has been confirmed by delicate experiments in simple cases where sufficient control over the experimental conditions can be maintained. This deep-level connectedness entails that our choices, although highly personal in terms of their meaning to us, have another aspect that transcends the individual. A choice made by one person generally has an 'instantaneous effect' on the objective tendencies associated with far-away entities with whom he has interacted at some time in the past. It is as if the entire universe is, in some sense, a single organism whose parts are in instantaneous communication. This means that although each of us participates in an individually meaningful way in the process that infuses form into the universe, and can shape this process

in accordance with his own personal values, nevertheless the process is basically one universal activity of which each of us is a highly integrated part. Quantum theory indicates that we are all, far more intricately than appearances indicate, facets of one universal process. Thus, according to the quantum conception of nature, the notion that any one of us is separate and distinct from the rest of us is an illusion based on misleading appearances. Recognition of this deep unity of nature makes rational the belief that to act against another is to act against oneself.

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