

SCIENCE AND CULTURE FOR THE 21ST CENTURY
Science, Cultural Change and Human Survival

by

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Before we can speak about science and culture in the 21st century we will first have to address the prior question of human survival. It is already clear that we can not simply assume that the way each of us and each of our societies function and are organised, will ensure the continuation of the human species. Humankind seems to be at a major crossroad, facing a choice between selfdestruction and a major step in human evolution. The specter of humankind's extinction as a result of its own actions or failure to act, is becoming one of the real possibilities, either as a result of nuclear war, or more slowly, as a result of environmental destruction. We also know and hope that survival is possible, providing correct and timely actions are taken., leading to major adjustment in man's collective and individual behavior.

The basic problems that face humanity and that bear on the continued habitability of the earth, are already quite clear and will become clearer still when we enter the 21st century, eleven years from now. Even now it is already quite obvious how ill prepared we all are, the rich and powerful just as much as the poor and weak, in the face of these life and death challenges

We can not hope, for instance, to slow down the warming of the earth to a level where adaptation by humans and biota remains possible, without developing and using- over and beyond efforts at greater energy efficiency - new technologies of energy generation and consumption that are less destructive to the global, regional and local environments..

The problem generally overlooked in this regard is the need and the determination of the developing countries to industrialize. With present energy technologies this will inevitably mean acceleration rather than slowing down of the greenhouse effect. Already now China, only at the initial phases of industrialisation, is the world's 3d largest producer of CO2. There is therefore., for the industrial and developing countries alike, an urgent worldwide need to develop new energy technologies for use in industrial as well as developing countries. It will in fact require a global energy regime that gives top priority to the rapid development all over the

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world of such new technologies .. There are already some studies indicating that simply building more nuclear powerstations will require a level of investment too large to be practicable. There is also the intractable problem of storage of toxic nuclear waste. The need for cheaper technologies , apart from being more environment friendly show that both poor and rich countries have a stake in such a global energy regime. And this in turn will require a major effort on the part of the 3d world to develop their capabilities in science and technology.

Even if global warming can be contained within a 3 degree Celsius range, its impact on weather, on patterns of agriculture, fisheries, food production across the globe , will be very unsettling and quite uneven, with serious economic and geo-strategic consequences. The rise of sealevel will also have major consequences for coastal areas and cities. The cost of developing more energy efficient and ecology friendly technologies should be delinked from the price fluctuations of oil or natural gas, but should be compared to the cost of moving coastal cities and large populations to higher locations inland.

In addition it is important to realize that the poverty gap may well constitute one of the major obstacles to global regimes of any kind, as the result of different perceptions between the rich and the poor countries about their respective priorities and the nature of the global regime necessary, and of the difficulty under such circumstances to agree about how to share both the burdens and the gains between them. Overcoming or at least reducing the poverty gap may well be an important prior condition for effective global management.

The poverty gap also constitutes a global problem in another way.. That gap has not only become wider in many parts of the world; it has also developed additional dimensions. It now includes the growing disparity between the rich and the poor, between those who have work and those who don't; and between those who have access to modern knowledge and those who don't, both within countries and between countries. Coupled with the great differentials in population growth rates between the rich and the poor, these disparities are bound in the next few decades, to lead to major population movements all over the world. Already now such pressures have developed between the Mexican and US borders, and between the Northern and Southern riparian states around the Mediterranean Sea. Crossboundary movements of population are not infrequent in Africa and Asia as a result of population pressure on land, exhaustion of the land, erosion, desertification, and endemic violence. In the very near future water scarcity may well become a major additional cause of environmental conflict. Within countries too, population movements take place, either as a result of deliberate

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government policies or in the form of spontaneous urbanisation and migration. All these population movements are bound to increase in scale for at least as long as these social, demographic and economic disparities remain i.e. as long as international poverty remains. We may probably see a new period of massive global population redistribution in the early part of the 21st century, bringing with it major problems of racial, ethnic, religious and cultural strife.

Overcoming the poverty gap, globally and domestically, through a renewed international effort at development of the 3d world is the only way to prevent such disruptive population redistribution. Foreign aid and the reversal of the drain on 3d world resources resulting from the debt problem, as well as the resumption of a massive flow of resources to the 3d World, are therefore no longer a matter of charity or international philanthropy, but an essential requirement for the common survival of humankind in the 21st Century.

The growing realisation of the irrationality of the arms race and its weakening effect on the economic base of the military strength of a nation, has led to beginnings of a new detente. Whether this trend is irreversible remains to be seen. Many political leaders, institutions and power structures seem to have difficulty in adjusting to peace and the need, not only to live in peace, but with peace as well. Mankind has to learn that, given the destructive capacity of modern weapons, war has ceased to be a useful instrument of policy, and that the fruits of military conquest increasingly fail to gain the legitimacy needed. The principles of No War, and of peaceful resolution of conflict are no longer elements of a utopian dream but a practical necessity.

The funding needed for the massive effort needed to reduce the poverty gap may only become available from the savings of a major global disarmament effort, or through some kind of global taxation, as already proposed by the Willy Brandt Commission and others. The opportunity cost should be seen in light of the financial implications of moving major coastal cities inland and of the socially and politically disruptive effects of massive population movements across the globe toward more affluent regions. The arms race and the adequate preparation for the 21st century then are mutually exclusive.

In the meantime we are already confronted with rapid and major social changes as a result of the communications revolution. We are now in the midst of the globalisation of national economies and of international markets, of the massive and rapid capital movements, no more related to the

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movements of goods but driven by the interests of large institutional investors and speculators. We are also witnessing the emergence of a transnational sphere in which large corporations dominate access to capital, skills, technology, information and markets.

Governments are no longer in control of the flow of information or of capital, and are incapable of holding the transnational corporations socially or politically accountable. All this has made the international economic system quite unstable and fragile. Its interdependence in addition tends to amplify small deviations into major events. The emergence of new economic nationalisms and the tendency towards establishing regional market integration should be seen as reactions to both the instability and unpredictability of the international economy as well as to the sharpened competition that is rooted in the constantly shifting international division of labor resulting from continuous technological advances.

The information revolution has also wrought major changes in the political processes as well as in lifestyles and expectations in almost all countries, sometimes - and especially in many developing countries - beyond the capacity of the national economy to meet those expectations except at the cost of considerable inequality. Different cultures and different individuals have different thresholds for change. The rapidity of change has in many countries already led disorientation, alienation of the young and the poor, anomie behaviour, random violence, and drug abuse. These are signs of a society under stress.

It is very likely that when the first advances in biotechnology begin to enter world markets social disruption especially in the 3d world will considerably compound those stresses. Already now the likelihood that biotechnology as developed by the major corporations for instance, may well make various commodities commonly produced in the developing world for exports to world markets, redundant. Unless 3d world countries develop their own capability in biotechnology and thereby become capable of keeping food production up with population increase and of maintaining their competitive edge, they may well become defenseless against those advances in biotechnology whose impact on agriculture may serve the interests of these corporations more than they do the needs of 3d world countries. It is essential for the developing countries themselves to develop an adequate capability in the field of biotechnology, serving their own needs, and utilizing the potentials of the genetic pool locked in the biological diversity of their biota. Otherwise the arbitrary application of biotechnology may well further widen the gap between rich and poor, ultimately destabilizing these countries and making effective global management even more difficult if not impossible.

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The redirection of science and technology with a view to make possible the abatement of global warming and the adaptation of agriculture, industry and social arrangements becomes the overriding priority of all nations as we move into the 21st century. Whether the scientists themselves will be able to bring about this redirection, whether the marketplace or governments can and should do it and whether it is possible to do so without destroying the creativity of the sciences is one of the open questions that we will face in the near future.

It is obvious therefore that as we enter the 21st century we will all have to learn new lessons, especially those which the recent advances in the sciences, teach us, about our interrelatedness with the physical, chemical and weather systems of the earth, about the impact of human action on them, and the impact of global change on the human condition and the human response needed to these global changes. We will have to learn also about war and peace under present conditions, about our common vulnerability and common security, about the fragility of the global environment and local eco-systems, about the inherent instability of the international economic system, and about the implications of the combination of unequal population growth and unequal economic growth in an interdependent world. We need to learn a great deal more about these changes in the human condition, and will have to continue to reduce the areas of our ignorance. It is already quite clear that in any case we will have to learn to handle much larger amounts of information through more research, better conceptualisation and integrative thinking.

The lessons that need to be learned obviously do not only lie in the cognitive field. They very much should help change human attitudes, behavior and values. These cover the acceptance of a sense of limits, something quite alien to the "hubris" which so characterised man in the beginning of the 20th century. Men and women, post-modern, modern or non-modern, all will have to learn to live with complexity and vulnerability and a great deal of unpredictability, as inescapable conditions of life in the 21st century, and we will have to learn to do so without recourse to irrationality. We will have to learn that we do not stand outside the very complex interactions between the globe's social and natural systems, but are part of it. We have to learn to accept that we can not control these systems, but can at best learn to influence somewhat the probabilities of outcomes from within the system. As a result we will have to learn to live, together with all other human

beings, within the limits that the global life support systems on which all ultimately depend, impose on us.

In that way we are also inescapably tied to our fellow human beings. Our common dependency makes us all brothers and sisters, however great the geographical, social and cultural distance between us. Our fate will as much depend on the actions or failures of our poorer, weaker and more ignorant fellow human beings in the poor countries, as on the power of the rich to mobilize science and technology to protect and advance their interests. The rich and powerful can not hope to survive without the active participation of the poor in maintaining the global life support systems, and vice versa. Recognizing this, we all have to learn to expand our moral horizon, so as to include humankind all over the world, and in a temporal sense, future generations as well, in a new all encompassing feeling of human solidarity.

Whether one likes it or not, there is not going to be a separate future for the rich, and another one for the poor. We either will have a common future or we will have none.

Many of the lessons we will have to learn deal with human values and major shifts in those values or their configuration. We will for instance have to develop a sense of responsibility for the state of the earth, mankind's common heritage, reflected both in our individual and in our collective actions, and to make sure that we will leave it to our children and grandchildren in a state not worse than the present one. at least. We will have to develop our capacity for empathy, so that it can cross boundaries, and racial, ethnic and religious differences. We will have to learn to compete only within certain limits, and learn to cooperate with each other more effectively, and on a larger scale than we have done so far. We will have to develop in our shift from war to peace, more effective ways of conflict resolution. We will have to move from a concept of survival of the fittest to human solidarity, and finding new ways to reconcile economic growth with social justice within the limits of the earth's carrying capacity. This may well mean that we will have to prepare ourselves for a life of sufficiency rather than of affluence and abundance.

We have to develop and articulate an **ethic of human survival and human solidarity** as the lynchpin in what may well turn out to be a second Copernican Revolution, one in which the international system is not just a conglomerate of autonomous nationstates in which cooperation is limited to the extent of common economic or security interests., but a system in which the nationstates all revolve around a common core of basic human values, in which the ethic of human survival and solidarity constitutes a central one., and in which the sharper edges of national sovereignty are voluntarily

blunted for the sake of common survival. We have reached the point in human history where the national interest is continuous with human survival. We will have to learn these lessons. But more importantly, we will have to learn them all over the world at the same time, if we want global cooperation to be effective.

Value changes of this fundamental character, amounting to profound shifts in many existing worldviews, force us to realize how much the accelerated increase in knowledge and power, has at the same time also extended the area of human responsibility, without there being much evidence of a commensurate increase in wisdom in using that knowledge, nor an increase in the human capacity to control himself.

We will therefore not only have to learn how to accelerate our learning capabilities in the cognitive field- how to digest a much larger amount of information without being overwhelmed by them; how to deal with the inherent complexity of many natural and social systems, and how to rid ourselves of the reductionism, so common a pattern in much of conventional scientific thought.

But beyond this we will also have to develop the ability to speed up the process of internalisation of the requirements for human survival.

This brings us to questions of the transition of knowledge into understanding, and its integration into our personal and collective consciousness and valuesystem. In fact we will have to learn to accept our responsibility for the state of the earth and the viability of its life support systems. None of us, and this includes all cultural, moral and spiritual leaders in our societies, can afford to remain unfamiliar with the social and ethical implications of science and technology. For technology choice now is very much a cultural and an ethical choice.

Integrating the requirements for human survival, an element so new and unprecedented in the human experience, into our individual and collective valuesystems will most likely be a disconcerting experience. All the collective human experience embedded in the reptilian part of our brain run counter to the notion of not having any external enemies, and having to cooperate together. All our cultures are faced with this challenge. Meeting this challenge which will tax to the extreme the capacity of most of the world's cultures in terms of their ability to reinterpret their basic tenets and the assumptions on which their worldviews and notions about social, economic and political organisation are based, so as to make creative adaptation and innovative responses, and as a result their continued relevance and viability, possible. Too great a rigidity or incapacity for creative adjustment are bound to doom many cultures in this transition.

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We should not forget that individuals as well as cultures have different thresholds of tolerance for change. It is now also already clear that the pace and depth of social change the world over has led to various degrees of disorientation, alienation, intolerance, anomie, drugs, deliberate or random violence, and even to the disintegration of cultures. These have for many raised the question anew of the ultimate meaning of human life on earth and the significance of each of our religions and traditions as guideposts on our journey into the uncharted waters of man's new condition. It is a challenge none of the world's religions can escape. We will have to develop, through our capacity for moral reasoning, new values that are relevant to these challenges and at the same time integrate them into our own valuesystem, and thus help retain the integrity and vitality of our culture, irrespective whether we draw our strength and insight from the traditional religions or from non-religious ethical systems. This is one way in which we could learn to raise those thresholds of the resilience of our culture through better understanding and selfreflection. Likewise we will have to try to push back the outer limits of our capacity for institutional and social adjustment through social learning.

It is also important to realize that there will not be a single answer to these challenges before us. Continued cultural diversity is one way to ensure the widest possible range of responses, and hence the greatest probability of survival of the human race.

Science and technology must also be directed to help humankind in dealing with the problems of governance of human society at the national and subnational levels, but especially on a global scale in ways that are respectful of cultural diversity and freedom.

At the same time it should be realised that these problems are too big and too complex to be left to the scientists alone. Certainly one of the requirements is for greater social responsibility and accountability of the scientist, the corporate manager and the military. But it will also require a much greater degree of sophisticated understanding of science and technology on the part of scholars in the humanities, in the social sciences, and on the part of spiritual leaders. They should illuminate the social and ethical implications of scientific and technological advances. But the major decisions on scientific direction, ethics and technology choice should not be left to the scientists, business leaders or economists, but should be political decisions based on the consensus of an informed public.

How does a culture retain its integrity and its identity in the face of the challenges to its autonomy, and especially in the face of the powerful

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homogenizing and universalizing tendencies unleashed by science and technology.

It will not be able to do so by isolating itself from external influences. In this interdependent and highly competitive world. The price of isolation may - aside from its own vitality and its own sense of purpose - well be irrelevance, stagnation and decay. Survival and rejuvenation may very well depend on a culture's capacity to respond creatively to these external challenges, i.e. in ways that are felt to be in consonance with the moral core of the culture concerned, and at the same time to enable the culture to compete effectively with other cultures in the economic, political and cultural fields. It can however only do so, if its own scientific and technological capabilities and its value configuration enable it to do so. That is if there is an adequate capability to reinterpret its basic moral tenets and the worldview that flows from them, in such a way that a sense of continuity of meaning is maintained. It means the willingness to take the risks of openness to outside cultural and scientific influences and to interact freely with them.

The evaluation, integration or rejection of particular external influences requires continuous public debate at the national level, that is also free, as part of a never ending process of cultural selfreflection.

A nation's sense of its own identity is not eternally fixed. It is in one way shaped by the slowly changing perspectives under which it views the world and by its own historical experience as well as by a nation's collective aspirations. But in addition it is also shaped and continuously redefined by the choices it makes in its interaction with other cultures, with science and technology and with the reality of an international order that among large parts of the worldpopulation is perceived to be immoral and unjust.

It is therefore not surprising, with the exhaustion of the great ideologies that have given some sense of direction to the unfolding of world history in the first half of this century, many have taken refuge or have fallen back on the certainties that they felt their religion gave them in order from there to build morally more satisfactory institutions and guidelines for individual and social conduct. And as social change is bound to accelerate their unsettling impact on human life and social organisation these expectations in turn constitute major challenges to the world's religions. Incapacity to meet these expectations may well have very serious consequences for the religion concerned in the form of growing irrelevance to its believers, loss of faith, schisms and sectarianism. It is at the same time also possible that the urgent questioning of religions with regard to the transcendental meaning of human life may lead to a revival of interest in the religious experience rather than in the ritualistic side of religion., which in turn may have a profound impact on human values and behaviour.

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Before it becomes possible and meaningful therefore to speak about the role of science and technology for the 21st century, the sciences will have to address the prior question whether they can contribute to ensuring the continued habitability of the earth, the continued governability of the human race, thus ensuring its survival. In addition the sciences will have to help enhance the adaptation of human beings and society, as well as of foodcrops and the like, to the new circumstances. It is this sciences's response to these questions that will shape the nature and direction of science and technology in the 21st Century. These responses will also be determined by the capability or inability of the cultures of the world to incorporate and integrate modern science and technology into their valuesystem and worldview. and to develop responses to the challenges to human survival of their own. that are effective but also consonant with the basic tenets of that culture. Such acts of creative adjustment and selfrenewal of a culture require an enhanced capacity for moral reasoning and the willingness on the part of that culture continuously to re-interpret itself without loss of its own identity.

In a sense humankind shares most of its values, though their configuration may be different for each particular culture. It is clear that when we enter the 21st century and manage to survive, we will have gone through a major civilisational change, the shape nor the implications of which are now foreseeable. Survival may well mean that humankind has been able not only to avoid selfdestruction, but has managed, through creative adaptation, to take the next step on the evolutionary ladder. In this transition, to quote the Dutch philosopher Van Peursen, the future turns out to be an ethical category. It is a realisation that is both frightening and encouraging at the same time. We may well have to live by it.

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