

# Science for the 21st century\*

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Let me first warmly thank UNESCO and ICSU for the invitation extended to me to take the floor at the opening ceremony of this Conference and address it on behalf of the Third World Academy of Sciences, over which I have the honour to preside. I am aware that this distinction is a tribute to the many colleagues of our generation who, in the developing countries, under the pressure of necessity, after training and often working abroad, have been summoned to an early assumption of responsibilities in science and technology development, over many years, in their own countries and sometimes in the international arena. I am sure that this tribute would be particularly fitting for my predecessor and founding father of our Academy, the late most distinguished scientist and international personality, Abdus Salam – one of the great flagbearers of science. First and foremost, he thought that basic sciences should receive special attention, for there is no applied science – i.e. technology – without science.

Ladies and gentlemen, allow me to recall that we are assembled here on the threshold of a new millennium to ponder on the pressing demands for launching a new social contract under the aegis of science, bearing in mind at the same time the recollection, not only of the upheavals and pangs that science has mainly entailed in this terrible century of ours, but also of the splendid enlightenment it has brought about, enlarging and deepening our understanding of the workings both of nature and of the very fabric of society.

A new social contract for and with science and technology as a lever for improving the lot of the species does also, of course, remind us of an analogous contract, first enshrined here in Europe two centuries ago. According to John Burnett – as cited by Schrödinger – this quest of science for rational enquiry is deeply rooted in ancient Greece. For him ‘it is an adequate description of science to say that it is essentially thinking about the world in the Greek way’, a vision that along the last centuries has steadily shaped our world.

The pursuit of happiness and the happiness of pursuit, according to Albert Hirschman, are equally fundamental human aspirations that the new contract we are now

supposed to search for must not forego, in spite of the infinitely more complex and daunting context of the present age. In fact this last aspiration is the main source that moves the first pursuit, for science should, so as to say, be placed at the service of happiness, to encompass the knowledge not only of humanity, but also of nature as a whole.

The pursuit and achievement of science and of technology – which is intrinsically more and more ancillary to science – has contributed powerfully, via growing energy production and utilization, to diminishing human toil; it has improved health and increased the span of human life; through progress in transportation and communication, it has fostered the mutual knowledge of individuals and of cultures – millions of human beings cross national borders every day and hundreds of millions of written, visual and sound messages are exchanged almost instantaneously, all around the world.

We rejoice, as we indeed should, at these many blessings of science. However, these high-sounding claims should not divert us from the awareness of the terribly dire consequences of the inconsiderate use that society has made of science and technology throughout history, in war and in peace. Most of the time, the social contract we are referring to has been broken – as has been abundantly demonstrated in this part of the world, where the pursuit of collective happiness was ultimately doomed by the sacrifice of the right to the pursuit of happiness by the individual. And so, the fruits of the happiness of pursuit have indeed met with much more success than those born from the pursuit of happiness.

Firstly, the fruits of science and technology have not significantly benefitted the majority of human beings living in the Third World. The asymmetry in the distribution of wealth, of safety and of comfort has, in fact, increased in recent times, as testified by the 1998 United Nations Human Development Report. ‘Some 80% of the world’s people live in the Third World countries but they have just 22% of the world’s wealth. The poorest fifth of the world’s nations held 2.3% of the world’s riches 30 years ago; today they possess exactly 1.4%. In more concrete terms, the assets of the three richest individuals in the world exceed the combined GNPs of the 48 least developed countries; some 358 global billionaires have wealth equal to the combined incomes of the world’s 2.2 billion poor people, that is, nearly half of the global population’. And more: ‘of some 4.4 billion people in the Third World – still

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characterized as developing countries by the United Nations, even though most of them have not been developing at all – three-fifths lack access to safe sewers, two-thirds lack toilets, one third have no access to clean water and a fifth lack any kind of modern health care. About one quarter of Third World people are illiterate'. A new social contract conducive to peace must as of necessity squarely face and tackle this situation with all intent and determination to start solving these unbearable misfortunes. In all fairness, the richest countries of the world have just decided to forego about one-third of the debt incurred by the poorest ones with the international finance and government institutions. Although this decision is in the right direction, far more must be done.

Secondly, the growing adverse impact on nature resulting from human actions in the exploitation and transformation of natural resources may severely compromise our life-sustaining systems on a global scale, to the detriment of future generations. Of particular concern is the warming of the planet by the greenhouse effect resulting from human actions, mostly taking place in the industrialized countries.

Thirdly, the new information and communication technologies, despite their immense potential to deal with developmental issues for the dissemination of culture and education, are bringing forth new risks affecting not only fundamental individual rights such as the right to privacy, but also the safety of trade and even national security itself in the face of a growing potential for war: the cyber war.

This baffling picture is further reinforced when consideration is given to the potentially harmful consequences, for both individuals and for society's very texture, arising from the new findings in biology, particularly those bearing on genetic manipulations. Besides some risks and uncertainties related to these new applications of science, scientists of the Third World are deeply concerned about the proprietary aspects of genetically modified seeds, which conflict with the millennial rights of farmers to keep their seeds. It has to be stated that life forms belong to all of humanity and are not patentable entities.

While these risks may affect us all, they do so asymmetrically for, again, it is the poorest sections of our society, both at the national and at the global levels in the economically underdeveloped regions, that bear the brunt of these inconvenient facets of progress.

Admittedly, risks do also create immensely useful new opportunities for the developing world. So, there is hope and scope for action.

On the international scene, the reversion of the traditional North–South flow of scientific information as a core aspect of the ever-increasing number of cooperative research projects calls for immediate action. In fact, the need for Northern scientists to work closely with their counterparts in the South constitutes an important part of an intricate chain to advance problem-solving scientific research on a global scale – moving, for instance, from global climate change, biodiversity conservation and utilization, to

geographically distributed research equipment on astrophysics to support large-scale operations. This approach would for example extend the ongoing cooperation of scientists from the South with international laboratories such as the European Laboratory for Particle Physics (CERN), the Fermilab and the International Space Station, dealing mainly with fundamental big science physics problems.

The need for South–South cooperation stems from the sharing of many concerns related to science, technology and development by Third World countries, despite the differences in their geography, culture and economy. Many of them, which are arid, semi-arid or tropical, also share problems resulting from their biogeographical similarities over and above their geopolitical locations. Some of these problems could be tackled, for instance, by the utilization of modern space technology. Brazilian, Indian and Chinese data-collecting and remote-sensing satellites could address down-to-earth concerns: changes of temperature, humidity, carbon dioxide concentration in the atmosphere and real-time data on alterations in soil and water quality, which are important for the examination of critical environmental problems, are also of great social and economic importance for many other developing countries. Brazil has in fact offered the use of its satellites and data-collecting platforms to African countries through UNESCO. Ultimately, the entire scientific community, both in the North and in the South, reaps benefits likely to accrue from using scientific data and knowledge to solve real problems faced by real people, especially the two-thirds of the world's population – some 4 billion people – living in the developing world.

Another approach worth exploring is the establishment, by scientists from the South, with the cooperation of their colleagues from the North, of networks devoted to the solution of pressing concrete science-based problems. The present Third World Network of Scientific Organizations, TWNSO, could, in collaboration with ICSU, set the pace for such initiatives.

Culture and languages in their diversity constitute an essential and rich component of humanity's heritage, but they are also barriers to communication and mutual understanding among peoples. The project to allow the on-line translation in real time via the Internet of different languages opens the way to overcome these barriers and offers a most extraordinary opportunity for the effective creation of a world virtual university, in fact for the development of virtual education at large, accessible to millions of individuals all over the world.

This project – Universal Networking Languages – presently involving scientists of 15 countries under the leadership of the United Nations University Institute for Advanced Studies in Tokyo, is most exciting and constitutes perhaps the greatest contribution that information science may offer to peace, overcoming the Tower of Babel syndrome, while at the same time preserving the linguistic diversity of cultures.

In fact, education at all levels is present, as it certainly should be, in every single agenda item of our meeting and I shall not therefore dwell on it further.

The immense task of overcoming this dramatic situation demands also the appropriation by all of the accumulated experience of those countries that have lately emerged to industrialization. One should however bear in mind that developing countries comprise an extremely diverse ensemble and that no single prescription for development is valid for most of them.

Although industrialization in itself should be a desirable goal to be eventually attained, the choice of the development route, as pointed out before, should take into account not only the social and cultural environment, but also the physical local production factors.

However, it is to be emphasized that underdevelopment should not be comprehended as an early stage of the industrialization process. The industrialization route observed by developed countries during the last two centuries, from the Industrial Revolution on, in practice, is really not reproducible in the developing countries. Late-industrialized countries, like Brazil and others, must credit their own relative success, on the one hand, to the massive access to, and transfer of, technology made possible by the political use of the many power disputes which characterized this last century – with its two World Wars and a long-lasting Cold War – and most significantly, on the other hand, to a concomitant comprehensive science education policy. In the last 50 years the Brazilian university population has, for instance, been multiplied by a factor of 34, leading to a considerable expansion of scientific production and to important technological developments in some key areas. Furthermore, it should be recalled that part of the success must be credited also to various tariff barriers and secluded market reserves. Such a policy seems manifestly most doubtful in the present globalized liberal world and is certainly not sustainable for those nations that have not yet succeeded in attaining a certain level of development, unless new major policy initiatives are adopted for their benefit.

One should bear in mind, agreement with the more helpful considerations expressed by Surendra J. Patel, that during the three decades which are considered the 'Golden Age' of the South's development (1950–1980), the South as a whole with its over 140 states and 4 billion people bettered the 80-year record of the North's 19th-century advance (1820–1900). The South did this in half the time, at twice the growth rates and with six to seven times (on average) the North's population. So according to Patel, 'no matter how severe the current crisis, it is good not to forget these monumental achievements. The lessons of this rich experience need to be distilled'. This may help to forge future strategies for overcoming the past weaknesses and building confidence on its strengths.

Admittedly, these new strategies will depend heavily on finding a successful solution for the present anarchic situation prevailing in the world's financial system, dealing nec-

essarily with a new definition of the roles and functioning of the World Bank and the International Monetary Fund (IMF). Indeed, the recent financial crisis that has affected some major emerging nations may, for instance, entail a 2–3% reduction in their gross national products (GNPs). If this is in fact to happen, 3 billion people would cross the poverty line in Brazil alone. It would also lead to a reduction in GNP of about US\$ 25 billion, which represents more than double the total current yearly science and technology expenses of my home country.

The approach that will lead to any meaningful success in facing the disparities among nations must, in addition, put a stop to the accelerated reduction of inter-national development aid, now amounting to a mere 0.25% of the industrialized countries' GNP. This corresponds to US\$ 30 billion. In fact, in the 1990s alone, international aid was reduced by 40%. The re-establishment of these funds should support science development in Third World countries, in addition to their own national efforts.

One should strive to avoid this Conference repeating the frustration in reaching its goal that happened with the Vienna United Nations Conference on Science and Technology for Development, on which many of us present here today placed extremely high hopes 20 years ago. First of all, one should realize that the overall state of the developing world is worse today than it was in 1979.

The new social contract shall only prevail if these factors, among many others that make up the present world scenario, are faced with courage and determination by our societies through a reinforced United Nations' system, the non-governmental organizations and the organized efforts of the world scientific communities. I am sure that organizations like TWAS and TWNSO, together with ICSU, have an important role to play, making an outstanding contribution to this new commitment.

Bertrand Russell, one of the intellectual giants of the 20th century, has told us that his thoughts and actions were profoundly influenced by the content of Emmanuel Kant's epitaph, which refers to the two wonders of life, the starry heavens above our heads and the moral law within our hearts. The new social contract that is being discussed here shall transcend the new millennium only if the fruits of star-gazing, fulfilling the right of the happiness of pursuit, go together with the commitment, within our hearts, to the moral law in our pursuit of happiness.

This should be our pledge in this new contract.

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