

The Role of Science and Technology in the Quest for a World at Peace¹

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INTRODUCTION

The past few hundred years of human history have witnessed remarkable developments in science and engineering. Man's profound scientific understanding and his engineering facility have expanded very rapidly. At the present time, it continues to accelerate, affecting greatly almost all aspects of people's activities in all but the least developed areas. Medical diagnostics and treatments, pharmaceuticals, appliances, transportation and communications facilities are examples of the ongoing revolution that greatly affects individual lives on a daily basis. The advances in health, comfort, convenience and personal well-being are most evident.

Despite these inspiring accomplishments, the future is more and more threatened with a deterioration of the quality of life and the proliferation of social inequities. It is therefore imperative that societies make planning for the future a high priority consideration. Appreciation of this need is increasing, having become much more widespread in recent years as people find the various manifestations of the pressing problems part of their own life experiences. In looking toward the future, it is incumbent on us to consider our past and present circumstances in order to establish key issues, priorities and necessary action. In this way, the impact of the threats may be minimized and cultural, ethical and humane values may not only prevail but even be enhanced. Many individuals and organizations have already devoted much effort to these questions. Much still needs to be done to bring societies and governments into effective action. It is my intention here to present some impressions obtained from a number of the studies that have been already made while emphasizing the degree to which many of the current and potential problems are interconnected.

The objective is to identify major factors that contribute to or generate the conditions that threaten our planet. Such factors must be controlled so that their harmful effects may be minimized or reversed. Failure to do so could lead to great harm to the earth and life upon it. When we think of problem areas, we think of the environment, of human violence and warfare, of the many failings of human character, of the failings of leadership, of the interactions of economics, population and human psychology, of health the food supply, and we wonder about the extent to which many of these problems are interconnected and whether the interconnections can be sorted out so that there may be some hope of dealing with the problems effectively.

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ENVIRONMENT

Much discussion has appeared in the literature of organizations dedicated to preserving a healthful and humane environment which concerns the many human activities that have severely degraded the environment. These activities threaten the habitability of major portions of the earth and perhaps all of it. How far do we have to look to find examples? Polluted air, waterways and oceans, ravaged lands, erosion, desertification, deforestation, and radioactive and chemical wastes are by now either common experience or common knowledge. Even the more esoteric threats which may not be as broadly appreciated or sensed, such as the depletion of the ozone layer and the accumulation of hothouse gases, have been brought to our attention. At which point does the damage become irreversible? How great an insult can the earth take and still bounce back? Have we passed the point of no return with some of these issues? Possibly, probably not. It would be prudent, nevertheless, to take immediate steps to minimize the effects of the various threats. This requires no less than world cooperation among societies as well as their governments. Can this be achieved?

There is another aspect of a proper environment that is important to consider, namely, quality of life. This means various things to various people, but it may be broadly described, as an aspect of life that goes beyond the minimal requirements of subsistence, shelter and basic health needs. For many of us, quality of life involves artistic, esthetic and intellectual components, human decency, high standards of behavior, peace, trust, kindly interactions among peoples with a respect for human dignity, and sufficient space in which to dwell. The amount of space for comfort may vary considerably among us, but I believe that most of us need room for privacy, thought and contemplation. This is not to be found readily in congested cities and congested living conditions brought on by high-density population.

High-density population impacts profoundly on the environment and all aspects of the quality of life. It is difficult to imagine an environmental problem that would not be improved by a decrease in population and made worse by an increase in population. Since the current trend is manifested by an explosion of population in many parts of the world, it is clear that this factor in environmental problems demands immediate attention.

The exceedingly high temperatures experienced in Europe this past summer may well have been a manifestation of global warming. If so, we have a clear example of one of the many serious consequences of ignoring the advice forthcoming from scientific and other technical groups.

NATURE'S STOREHOUSE

There are many reasons for not destroying huge ecological areas such as the rain forests. A main one is that such areas are vast biological storehouses of substances having important potential to benefit humans. This derives from the fact that living organisms including both flora and fauna develop chemical mechanisms that protect them from hostile environments, predators, infectious agents and disease. Such problems have been solved in nature in a great variety of ways, most of which are yet to be discovered. The compounds involved can possibly serve humanity in many ways, as antibiotics, insecticides, herbicides, fungicides, preservatives, drugs such as anticancer agents and antimalarials, heart drugs and

many other types of physiologically active substances. Destruction of ecological systems destroys the opportunity to learn their secrets forever.

ECONOMICS AND WAR

The earth is finite and the number of people whom the earth can support is finite, under the best of circumstances. As a consequence, people have developed the concepts of a sustainable economy and a sustainable earth. Rarely is the expression sustainable economy heard. The term economic growth predominates. Certainly activities that replace other ones can grow and, to an extent, new activities can grow. Growth can also be associated with a rising of the average quality of life in the world. There are limits, however, and the limits arise from limits on natural resources, limits on need and demand, limits generated by environmental considerations, and constraints on total population. The latter statement provides a clear indication that future economic policy must be in harmony with the finiteness of resources and population, and the requirements for a wholesome environment.

Economic competition is often enhanced by limited resources and markets. In the extreme case, it leads to warfare. A major component of many wars has been economic competition. There have been, of course, additional issues, but it seems fair to say that economic motivation has predominated. Economic competition should not be expected to cease when warfare ceases. The experience of the post World War II period, for example, is testimony to the fact that its underlying aspects of economic competition never disappeared, but simply has taken on another form. If and when the major players in industrialized states decide to confront economic reality by supporting and developing their human, humane and industrial capacities consistent with the broad concepts of sustainability and a large measure of self-sufficiency, they may be able to save their countries and future generations from severe economic hardship, if not destruction.

There is not much to say about war per se. It is enormously destructive, it dehumanizes and brutalizes survivors, damages the environment, wastes resources and may leave legacies of great potential harm to future generations. Nevertheless, warfare has been all too common a phenomenon in this past century. Societies must find other ways that are nonviolent to deal with their economic stresses and other perceived inequalities. Certainly, pouring arms into those societies that are most likely to use them offensively does not help matters. The large and apparently irresistible profit motive in the selling of arms makes control very difficult. The economic gain may be short range but the harm can be major and long-lasting. There is not likely to be a net gain for any society in the long run.

There are other circumstances in which perceived short-term economic gains motivate inappropriate behavior and result in net economic loss and harm to society. Industrial pollution is an example. Pollution often occurs because industry makes short-range economic decisions, or because appropriate legal regulations are not in place or are not enforced. I have made a point of this to emphasize that economic and environmental problems require clear thought on the part of all concerned. The problems that threaten the world involve everyone. Solutions to the problems may require expert help but the implementation of the solutions involves us all. Societies and governments must be strongly involved and come together.

GAINFUL EMPLOYMENT IN THE AGE OF AUTOMATION

I recall reading an article several years ago that characterized a present economic dilemma, namely, that a new revolution is taking place in manufacturing, without being accompanied by a subsequent reduction in the work week. A main generator of this revolution is automation with its accompanying efficiencies. The author asserted that this is the first time a major manufacturing advance in efficiency was not followed by a reduction in the work week. The consequence of this circumstance is that advanced societies are becoming remarkably incapable of providing meaningful employment for a large fraction of its citizenry. Expanding populations can certainly add to the problem. In the present economic climate in many developed countries, the industrial response to monetary problems is to dismiss large numbers of employees and overwork others. This does not lead to economic stability for society as a whole. Manufacturers must also be prepared to anticipate rather than simply respond to dwindling supplies of raw materials and rapidly changing markets.

It would be most appropriate for societies to analyze the social and economic implications of the rapidly developing technologies, changing markets in the world economy, and other powerful forces that affect the quality of life in their communities. The problems are not insolvable. It would seem that successful societies would need to have a sustainable plan in which all the population would have the opportunity to make a contribution and thereby earn enough compensation to enjoy what most people would recognize as a decent standard of living. Can this be achieved in the atmosphere of competition that has characterized the industrial revolution up to this time? Is it possible to achieve sustainable economies and decent living standards without inhibiting the various aspects of individual initiative and creativity? There are a myriad of questions that societies may consider. The world, however, can not possibly benefit from continued procrastination in facing these issues or wait for the results of endless debate and deliberation. Too much debate and little testing is as bad for societies as it is for science.

What would need to be done, were governments willing, would be to take a careful look at resources, human and otherwise, set goals on the basis of high and presumably workable ideals and implement them. There would be the need for flexibility so that, in learning from experience, corrections could be made in a stepwise process. This would require governments to be composed of people, or advised by people, of the highest intelligence and personal standards and whose greatest satisfactions would derive from the good results that they could achieve. This is not as difficult to secure as may seem. There are many such people. The important step is for governments to be open to accepting well-motivated, well-thought-out plans and make difficult, selfless decisions, for the good of society unencumbered by parochial considerations.

A view of the history of the twentieth century suggests that the world is more than ready but ill-prepared for such high-minded developments. That certainly seems to be broadly true. Nevertheless, there are a few countries that have renounced war and appear to have pursued, for long periods, steps toward a humane society.

ETHICS AND EDUCATION

It is important that young people be trained from an early age to question contemporary concepts and ideas that swirl around them. They should be taught how to think and draw rational conclusions. Together with this, the development of high standards should come from the home as well as the school, if they do not come from the home, they must come from the school. The learning of purely factual material is, of course, indispensable, but education obtained in the absence of fine-tuned reasoning and an ethical sensitivity is probably a major contributor to current societal ills.

Valuable leadership qualities are the ability to apply sound intellectuality to problems and to use the results in an ethical fashion. It is to be expected that an educational system that emphasizes such qualities in general would raise the standards and the quality of life for society as a whole. In addition to learning how to think, a very worthwhile feature of an educational system is for it to be broadly based. Perhaps we may hope that, in the future, training in graduate institutions will be a prerequisite to appointment to high political office and that the entering students will be among the finest graduates of an educational system that promotes broad scholarship combined with ethical principles. The world can always benefit from great leaders with impeccable standards having broad intellectuality and a good sense of what may be achieved in practice.

CHARACTER

We are told by behavioral scholars that it is important to start to instill character into children at a very young age. Otherwise, in general, it becomes much more difficult. This appears to be a subject that merits careful consideration, since it seems to be vital for the achievement of more humane and ethical societies in the future. In addition to building character, it is important to teach young people to have inquiring minds and well-ordered priorities. They must learn to think, gather information and draw rational conclusions based on the information.

Considering the threats to future existence, it is self-defeating to persist in maintaining many current societal priorities and values. There needs to be, of course, flexibility and respect for a variety of opinions, but when ethical standards, for example, are quite low, it should be possible to decide on which standards should be raised and in what way. We make laws to try to correct or prevent unacceptable behavior. It is much better when people's ethics, humane principles and self-respect make the laws unnecessary or, at least, seldom needed.

SUMMARY REMARKS

Interconnections

There are a number of issues concerning the interactions of humans with the earth and with each other. Some of the more important ones are listed in alphabetical order below:

- Economic matters
- Education

Environment
 Ethical, humane and wholesome behavior
 Finiteness of resources
 Health care
 Illegal drugs
 Population
 Priorities and values
 Quality of life
 Sustainability with limited resources
 Transportation

These issues are far from independent of each other. They are, rather, grossly interdependent. This interdependence leads to the concept of “indispensables”, namely, those issues that are particularly indispensable to the achievement of widespread improvements in the human condition. In fact, without proper handling of the indispensables, the attempt to achieve improvements in a broad sense by appropriate treatment of the other issues has little chance of success.

Indispensables

Population control is an indispensable. I am in agreement with many others who have indicated that unless population is brought under control, it will not be possible to enhance the human condition on a broad scale. Any progress will be eliminated by the huge numbers of people who must be supported if the unbridled increase in overall population persists. Population control must be achieved. A second indispensable is sustainability. The control of sustainability must be brought into the handling of environmental problems. Activities that degrade the environment can no longer be tolerated. Renewable energy sources, for example, must replace the burning of fossil fuels. Economic decisions impact greatly on the sustainability of the environment and, in fact, on the viability and sustainability of an economy. It was pointed out in a talk that I had heard some time ago that the inhabitants of Easter Island, located off the west coast of South America, used up all the resources of the island to the extent that they did not have enough food to subsist and did not have enough wood to build boats on which to escape from the island.

Proper human behavior is an indispensable. The amount of animosity of various groups toward their neighbors in many areas of the world is a serious impediment to progress. The ease with which seemingly cultured societies can be transformed to behave in a barbaric fashion is another sad lesson of the twentieth century. Such threats of unbridled hostility and violence must be curtailed if a proper environment for peace and stability is to be achieved.

Barriers

There are various barriers that can interfere with the broad attainment of a quality existence. The problems that need to be overcome are formidable. They are manifold and extensive. Great leadership in the world is required to overcome societal indolence, selfish motives, lack of character, perverse priorities and values, widespread unwholesome life styles, lack of cooperativity, extreme poverty, educational limitations, violence and the lack of suitable mechanisms to settle disputes peacefully, exploitation of the earth and of people and a population explosion that is out of control.

Societies whose survival is marginal can not readily give much attention to the issues that are raised in this presentation. It is very difficult for societies or individuals on the edge of survival to change the patterns of their lives. Many marginal societies are overpopulated, are under severe economic pressures, and have low levels of health care.

CONCLUDING QUESTION

We live in a world in which there are major inequities within societies and among societies. It is also a world whose future is greatly threatened. Do we want nature to take its course, a path that is often extremely harsh, or will the world's population and leadership be willing and able to take the major courageous steps required to mitigate nature's harshness, preserve the earth and generate a more equitable and humane future?

The role of scientists and other technical people has, at least in part, been observed for many years. This concerns the many warnings that have been made public concerning such matters, for example, as global warming, pollution, the loss of important information associated with the destruction of ecological areas such as rain forests and the bad effects of fluorine hydrocarbons on the ozone layers in the atmosphere. Scientists and engineers can provide education and modern equipment to countries that could benefit from such attention. This is starting. In the future, it is expected that education, health and technical assistance will increase.

For those matters that require more attention than that which would come from technologists, it is likely that organizations of scientists and engineers would be interested in considering participating with other groups to attain worthwhile goals. An example would be biennial meetings of scientists, engineers, members of peace organizations, world leaders, representatives of the World Health Organization and officials in the United Nations.

