

INTERNATIONAL SYMPOSIUM ON SCIENCE, TECHNOLOGY & DEVELOPMENT

DISARMAMENT AND DEVELOPMENT

BY

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INTRODUCTION :

One is aware that there has always been fighting in some form, within species and between species: for food, survival, mating and so on. The fighting could be cruel but was sporadic; and seldom had major relevance to the survival and existence of species and societies as a whole. War, in the modern sense, is a product of civilisation; and so we need to ask ourselves what counter vailing forces can be invoked to prevent it. It came about ever since cities were built and fortified, from which heavily equipped armies could be sent out and be supported from within; incentives for war with other cities closeby existed in the form of the need to acquire more area for exploitation and production of wealth. The scope of war enlarged in the transition from city states to nation states. Thus came about colonialism, and empire building.

With warfare came the need for technical innovations, which were largely of an engineering character: in the early stages arising from the need to have fortifications, earth works and use of mechanical devices as weapon systems. Thus in China, India, Assyria, Egypt, Rome, Greece, etc., there was scientific support for military operations.

One can define a lethality index for various weapon systems. From the earliest bows and arrows, and swords, to early field guns, the lethality index ranged from 10 to 40. With machine guns this went up to about 10,000; and this is the range involving tanks, modern field guns, fighter bombers etc. It suddenly shifted to one billion with the introduction of nuclear weapons. This large increase is easily understood. Earlier lethal weapon systems were based on chemical energy measured in electron volts; nuclear energy releases are measured in million electron volts.

Along with these lethal systems, there is a large amount of support mechanisms such as missiles, radars, electronic

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warfare, communication systems and so on. It is thus that modern science has begun to be an essential part of the military system. This has been particularly so since the Second World War.

Over the past 5000 and odd years of human civilisation, there have been endless conflicts, from small to large; but there have been some limits on human savagery. As a result, the killing of unarmed civilians, poisoning of drinking water, burning of defenceless cities, spreading of infection and so on were prohibited. There may have been sporadic instances of violation. But in general, wars involved the military and not civilians. It was during the Second World War that total war, unlimited in violence, unprincipled in method and indiscriminate in victims, was seen for the first time. It left 50 million dead. We saw the wiping out of entire cities, of Hiroshima and Nagasaki, through nuclear bombs.

Even without nuclear weapons, one saw the savagery of the blitz over England, the fire bombing of Dresden, the wiping out of large parts of Tokyo and Osaka in Japan a few months before the end of World War II, and butchery on the Russian front.

With the end of the Second World War, after this disastrous period of destruction, there was feeling that human-kind would not want more wars and conflicts. In other areas, there was a feeling of euphoria that colonialism, imperialism and exploitation were on their way out. The United Nations came into existence. It was felt that the world could look forward to a period of non-violent existence, with development and human uplift as primary objective. Three decades thereafter the picture that we see around us has belied most of these expectations. There is greater insecurity in the world than ever before.

The cumulative world military expenditure has exceeded 12,000 billion dollars. In contrast to the annual world military expenditure of over 650 billion dollars, only about 3% of this is spent on international development and cooperation.

There are now some 50,000 nuclear weapons; and the total explosive content of these weapons is equivalent to a million Hiroshima bombs. The advent of the nuclear age has posed an unprecedented question: not whether war would exact yet more lives, but whether war would preclude human existence altogether. The Bertrand Russel - Einstein Manifesto movingly asked the question: "Shall we put an end to human race; or shall mankind renounce war? There lies before us, if we choose, continual progress in happiness, knowledge and wisdom. Shall we, instead, choose death, because we cannot forget our quarrels."

In all of this, science and scientists cannot escape responsibility. We today see a continuing spiralling arms race. This upward spiral is essentially a high technology spiral. Most weapon systems, where step-function changes in technology take place, are not those ordered by the politicians or the military. They are made possible through the research efforts of scientists and technologists; and once it is known that this feasibility exists, naturally the political, military and industrial decision makers proceed further. A large part of the sophisticated weapon systems are thus the result of a technology push.

Individual scientists often work on relatively small parts of a total system. That small piece of work may be similar or identical in the civilian or military spheres. It is the integration of these various pieces at the level of system design that the real difference exists. Action in these matters, therefore, cannot be at the level of an individual scientists but of the community of scientists. Unfortunately, the real situation encountered is that many scientists, particularly those concerned with engineering and technology, wishing to engage in challenging tasks, find that the easiest way is obtain military funding - and this has led to the recent large scale phenomenon of defence led growth of high-technology.

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SPIN-OFFS FROM MILITARY RESEARCH : CLAIMS & FALLACIES

One of the points very frequently made is that military research leads to important innovations; and these are then of great value for human development. This needs to be examined carefully.

It is absolutely clear that the great conceptual break throughs in science have had nothing to do with military research. Thus the entire basis for what constitutes nuclear weaponry today was due to scientists working entirely to fulfil their sense of curiosity, and in searching for new knowledge in the unknown. It was the discovery of radio-activity by Becquerel (and we may recall his discovery of fogged photographic plates kept in a drawer with what is now known to be radioactive material); the work of Curies on radio-activity; the discovery of the nucleus by Rutherford and his clear views that nothing practical would emerge from this; of the neutron by Chadwick; of the fission process by Hahn and Meitner; the equivalence of mass and energy due to Einstein; all of which constitute fundamental elements in the base of nuclear technology. And none of these was in response to defence needs. The work of Archimedes, Galileo, Kepler, Newton, Faraday, Clark Maxwell, Marconi, Herz, Thomson, Einstein, Bohr, Heisenberg, Dirac and others; the birth of mechanics, electromagnetic theory, relativity, quantum mechanics and the like; none of these had anything to do with military research. The basis of modern electronics is solid state electronics; and this field became a reality through the discoveries in quantum mechanics and their application to solid state physics. The first of the discoveries in this field like the transistor which had nothing to do with defence research. This was followed by inventions such as integrated circuits and micro-processors which were all fuelled by the solid state electronics revolution in its own right.

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It is, of course, true that once the laws of nature are discovered, and there is increased knowledge available in the world, it can be converted to technologies relevant to defence systems. Thus, the great discoveries in nuclear science, solid state physics and electronics have all been used, in telling ways, to develop weapons of genocide. Sir Francis Bacon had remarked : "Human knowledge and human power are coextensive".

Again, all of the advances in modern biology, from genetics to the structure of DNA, the genetic code and genetic engineering have taken place through civilian research. The discovery by Fleming of the antibiotic, penicillin, was not motivated by military needs; it became the basis for a whole new area of chemotherapy relating to antibiotics. The coincidence circuit was invented for cosmic ray research, and it became the fundamental building block for modern computer technology; the latter is used today extensively for defence purposes.

I, therefore, assert that all the basic discoveries at the conceptual level, and major advances in our real knowledge of the environment around us, have come about not through military research, but through the motivations that constitute the essential elements of science: curiosity, objectivity, openness and the like.

And yet, it is true that military research, since it is invariably very well financed, far better than civilian research, and also much less questioned, and invariably targetted to achieve specific objectives, has had significant degree of success in absolute terms, and particularly in terms of technology and engineering. New materials, aspects of reliability and maintainability, new electronic capabilities and the like have been the results of targetted military research; and these have,

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in turn, been of great value in civilian areas. But one has as yet given cost figures relating to how much was spent for many of these advances and the corresponding spin-offs. I would assert that it should be possible to manage similar targetted systems of research for civilian purposes and achieve far more for the same outlays.

GENERAL CONSIDERATIONS:

We have seen how science has got increasingly involved with armaments; indeed, a large part of the armaments spiral has arisen through a technology push. This upward spiralling armaments race has brought humanity to the situation where it is at the brink of what could be a total wiping out of civilisation and of life as we know it. Apart from direct casualties of the order of 1000 million or more (WHO estimates), from a major nuclear exchange of the order of several hundred megatons, there could be far greater numbers affected seriously through possible ecological disasters such as the one termed "nuclear winter". Apart from the super powers and their direct allies who would be involved in such a major nuclear exchange, the rest of the world will also be affected by such ecological consequences. Equally, the developing countries, a large part of which are poor and can ill afford it, get sucked into more sophisticated weapon systems and higher military expenditure as part of the upward spiralling arms technology. We have seen how large are the magnitudes of annual expenditure that characterize the arms race; this has now become as large as the total international debt. When the world economy gets militarized to this extent, when so much development is at stake, it must clearly lead to distortions everywhere and particularly in international finance, international debts, and their repayment, world trade,

industrial recession and the like; this leads to social injustice and tensions in developed and developing countries and becomes the basis for violence and conflict. It is clear that we must try to end this madness. The question is how to proceed in this matter keeping in view the real nature of the world we live in.

First, I believe that every effort has to be made to stop any further upward spirals in the arms race. We are aware of the militarisation of outer space, in terms of satellites for communications control systems and reconnaissance. However, more recently we have entered into a new era referred to as "Star Wars" or "Strategic Defence Initiative(SDI)". This new step in the technology spiral, and consequent arms and expenditure spiral, needs to be halted. Many in the scientific community are excited by the SDI as it offers prospects of both technological challenges as well as large scale funding. The scientific community must be made to realize the implications of this increasing militarization of science and all that it can mean as time goes on.

Secondly, there is continued underground testing of nuclear weapons; that is the only form of testing now permissible after the Moscow Partial Test Ban Treaty. These underground tests can, and need to, be stopped. There is now enough evidence to show that adequate surveillance and verification is possible to pre-empt clandestine testing.

Current proposals relating to reduction of nuclear missiles in Europe constitute a step in the right direction; this has opened up an exciting prospect. This chance needs to be grabbed and extended, so that there is a real tangible reduction in nuclear weapons stockpiles in the world. The elimination of

all nuclear weapons is not possible in one go; but major reductions are possible, and will increase the spread of trust and confidence.

The maximum information that can be gathered through national and international verification systems, particularly through the use of satellites, should be made public so as to reduce dis-trust about the opponents' stockpiles, capabilities and reserves. President Johnson had once remarked: "We were doing things we did not need to; we were building things we did not need to build; we were harbouring fears we did not need to harbour". The "worst case" scenerio is invariably assumed by military planners in the absence of information concerning the capabilities of a potential enemy. Maximum information availability is the answer to this paranoia. All efforts to reduce the sense of suspicion, mistrust and insecurity that currently prevails must be taken; and all scientific capabilities of all nations to bring this about must be harnessed.

The arms race does provide at one level, technological challenge, industrial opportunities and employment. If the arms race is slowed down, halted or reversed how does one provide for all these.

We clearly need to plan for very major tasks and missions of global magnitude: that can provide technological challenges; that have clearcut objectives; which can provide industries with work; and which also provide employment.

Declarations and Resolutions by themselves will not produce disarmament. It is also a fallacy to assume that disarmament itself will lead to development. We need to work out the economic, social and scientific transformations to turn "Swords into plough shares". What is needed are concrete action plans in the areas

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of food production, health, challenging ventures in space and programmes relating to the deep sea bed and Antarctica, where even without a world government, there can be a tangible but slow surrender of national sovereignty in the interests of what one would regard as the common heritage of humankind.

We have today unfortunate stereotyped images of countries and societies; these are inherited from a past and highly exaggerated, leading to unnecessary suspicions. There is need for better communications to change these images to something more real and truthful. We must realize and propagate that there is common to all humanbeings a basic sense of values. Towards this "education for peace" must become a part of the educational system which unfortunately, is only tending to focus on knowledge and technical aspects of the scientific method. We must teach the place of values in the world of facts.

We should not ask for the Utopia of general and complete disarmament in one go; this will not happen; we have to be practical. What we should aim for are a succession of steps to build a climate of confidence, so that the human family can be brought together increasingly in a common pursuit of peace. Any decrease in suspicion and distrust, and corresponding increase in confidence, will have a significant impact on the collective human psyche, to work together in common cause, for the better things of life which science & technology have brought in our reach.