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THE FUTURE OF MAN IN THE TWENTYFIRST CENTURY

by Dr. JAYANT NARLIKAR



We have come to a condition when this is no longer an academic question, no longer the luxury of a philosopher to indulge in. The question has assumed not only pragmatic importance, but also fearful dimensions.

Dr. K.R. Srinivasa Iyengar, mystic and litterateur, Dr. Jayant V. Narlikar, scientist and Dr. M.N. Das, historian, reflect on the issue from their own angles. Dr. Mulk Raj Anand, the writer, and Dr. Malcolm S. Adiseshiah, the educationist, approach the subject on the basis of three questions THE HERITAGE put to them.

IN 1975 I happened to be present at a public debate at the California Institute of Technology between the scientist Fred Hoyle and the science fiction writer Ray Bradbury. The topic of the debate was "The message of science fiction: prophetic or profane?" On that occasion Bradbury made the obvious but important point: that the life of a person like him born in the first quarter of the present century was science fiction come to reality.

To emphasize the obvious in Bradbury's point let us imagine a few scenarios of our present day existence:

1. A man entering his residential premises in an automobile activates a hand-held device that opens the garage door for him. He drives the car in, approaches a lift whose doors open automatically. He presses a button and the lift takes him to the twenty first floor. He inserts a card in a slit at the front door and the electronic lock is opened. As he enters the lights in the hall are turned on. He goes into the living room and turns on the TV, by remote control to witness the Olympic games live from a distance of thousands of kilometres.
2. From the place of an accident in a remote village the helicopter picks up the injured victim, delivers him to a waiting jet plane which takes him to the airport of a major metropolitan centre where an ambulance rushes him to a hospital. There cat-scans are taken, other medical tests are done, the patient is rushed to the operation theatre where, if necessary a heart-lung machine can take over temporarily the job of keeping him alive.
3. Because of the malfunction in the central key computer the defence headquarters are given the message that a major nuclear attack from the enemy is on the way. The automatic response mechanism comes into operation: a counter attack with nuclear missiles is launched. The enemy discovers this in no time and retaliates. A full-scale nuclear war begins.

The first two scenarios are taking place daily, more so in the developed world and will take place in the less developed world in not too distant a future. What about the third scenario? It is not only possible, it is also probable but has not yet taken place. I will return to it later.

The point Bradbury was making was that to an adult in the last century or to someone who lived on to the early part of this century all this would have sounded science fiction from the pages of Jules Verne or H.G. Wells. Yet, these scenarios are taken in his stride by man today. This phenomenon, typical only of the twentieth century in the entire history of human civilization, needs to be looked at carefully while making any forecast

for its future.

Of course, as Alvin Toffler pointed out in his celebrated book 'The future shock' the above phenomenon is the result of the rapid acceleration in the progress of science and technology. Although Bradbury was considering his own life span for gauging the march of science and technology, the more dramatic of the developments described in the three scenarios above came relatively recently. Satellite transmission of TV programmes, the all pervading use of automation and computers, jet planes, advances in medical diagnostics and surgical techniques have come up in the last three decades. It is this rapid growth in the impact of science and technology that makes any future forecast so very difficult.

Nevertheless we may broadly divide the forecast into two parts—optimistic and pessimistic. The two views are based on how man, a supposedly rational animal, reacts to the impact mentioned above.

The Optimistic View

To begin with let us consider how our store of knowledge will grow. We extrapolate on the rising curve of how science and technology will improve our communications and information transfer. If the last four decades in this field belonged to electronics, we may safely argue that the stage is now set for the advent of photonics. Whereas in electronics, the key role of information transfer and storage was played by the electrons, in photonics that role is played by photons, the particles that carry light energy.

Today in the developed countries glass fibres are replacing cables for communication. A single fibre can carry several billion-bits of information channels if the lightwave technology is used. How much information can be transmitted at the rate of one billion bits per second? Something like 10,000 two-way conversations or three hundred two-way video conference signals! And, in present technology 144 such fibres can be accommodated within a diameter of one centimetre. This already dramatic achievement is bound to improve further both in making the systems more compact and in extending the distances over which communications are possible through photonics.

The use of photonics in computers of a later generation is bound to come. Another development, already under trials, is that of parallel computing. This involves making a grid of several small computers instead of making one big supercomputer. This reduces cost considerably and may in due course also improve the speed of computing.

Why are communications and computers important? As a civilization advances, its information content goes up enormously. This information must be stored in a readily retrievable form and must be swiftly communicable in times of need. Lack of information or, worse still, assumptions based on wrong information have in the past severely disrupted social structure. In a country like India which has a large fraction of illiterate adult population, this experience is not uncommon. We may therefore hope that with the unrestrained progress in the above fields our country is bound to benefit.

The second and by no means less important is the availability of ample sources of energy and devices for generating power. India does not lack the former, but it has much to do in the latter. If one were to look to the future for a really dramatic change in our energy/power situation, two ways suggest themselves.

The first is fusion energy; that is, energy obtained by bringing together light nuclei. The Sun derives its own power this way, by fusing hydrogen nuclei to the heavier helium nuclei. In the Sun's case, this is possible because of the tremendous pressures and temperatures generated at its centre by its own strong gravitational force. Can man reproduce those conditions in the laboratory although he lacks the stimulus of strong gravity? The answer is: yes but not yet! Fusion reactors are still beyond human technology but it is hoped that they will become feasible by the beginning of the twentyfirst century. Relying on heavy water for its nuclear fuel, these reactors do not demand esoteric fuels (like the fission reactors do) and are expected to be pollution-free.

The second source is the Sun itself. Solar energy will be available in abundance for billions of years and the amount coming the Earth's way is more than several thousand times what man needs. The problem is how to tap the reservoir in a cost-effective way. Attempts range from making more and more efficient solar batteries to proposals for gigantic reflectors in space that can focus the Sun's energy and beam it back to Earth. The latter must wait till space technology attains the necessary capability in the next century.

Starting from the discovery of generating fire man has learnt the benefits of power generation. Just as tapping the energy of coal, steam and petroleum led to the industrial revolution, so another revolution is in the offing once either of the above two energy sources can be tapped.

There are numerous other benefits from science and technology that man can enjoy in the coming century—it would be impossible to list or even anticipate all of them. To me, however, it seems that the key to substantial progress in human standard of living is held by the two I mentioned above: communication of information and power generation.

The Pessimistic View

It was in the same debate at Caltech that the pessimistic note was sounded by Fred Hoyle. I can do no better than begin with his cautionary note.

The tapping of any natural resources of this planet or of the star it revolves around is shared

by its inhabitants. It is a matter of simple arithmetic that no improvement would accrue to the individual if the number of sharers goes on increasing rapidly. The developed countries have appreciated this fact and succeeded in controlling their populations and have consequently enjoyed the benefits of it. The less developed countries are still groping to find a solution to the population growth problem.

Two factors contribute to this problem. Religious dogmas stand in the way of voluntary birth control. Even in this so-called age of science it has unfortunately not been possible to break through this barrier. The second factor is sociological. Large families (especially with male children) are considered respectable even though they are no longer economically viable. The conditions have changed from the ancient days when a bride was blessed "May you have eight sons." But this message has apparently not penetrated.

The situation is of course aggravated by some of the benefits of science and technology!



By reducing deaths at birth and prolonging the human life span, science and technology have added to the population problem. This trend will continue as better and better medicines become available in future.

Can science and technology not similarly provide simple techniques of birth control? Barring dramatic breakthroughs in medical science, this may not happen in this century. Even if this does happen, are we willing to use those techniques? Can we overcome our prejudices as a society as well as, as individuals to seriously tackle the population problem?

The threat posed by the population growth is more sinister than any other danger to mankind because it builds up gradually, and so it lulls the victims into complacency. An annual growth rate of two percent may appear small but it amounts to the population doubling up in thirty five years. If we simply extrapolate this result it implies an eightfold increase in a century and a thousandfold increase in three and a half centuries. Obviously, no amount of resources is going to be sufficient to keep pace with this kind of increase. Hoyle has argued that if mankind does not exercise voluntary restraint on its numbers, they will have to come down compulsorily through catastrophic means. Large scale deaths due to malnutrition, strifes inspired by hunger leading to breakdown of the social structure, diseases etc would see to it that the human species are cut down to size.

From today's vantage point such a view looks alarmist even granting famines in many parts of the world. But this is precisely why the threat is so sinister: we are complacent until disaster is at the doorstep when nothing can be done about it.

In this respect I rank the nuclear holocaust as second in its threat to mankind. Unlike the dangers posed by population growth we are constantly reminded of the instant annihilation of all species if a nuclear war is unleashed. The destructive power and ability to strike, of the present day weapons, far exceed what existed in the second world war. Apart from local destruction, the nuclear weapons can lethally pollute the Earth's atmosphere, thus rendering survival almost impossible even after the war is over. Thanks to developments in science and technology the programmes like 'star war' ensure exactly such an outcome.

It is because its terminal outcome is so readily apparent that considerable opposition to nuclear proliferation exists today. Although many safeguards are supposed to prevent the outbreak of a nuclear war by accident, the third scenario outlined earlier is quite possible. The only real safeguard against nuclear destruction is to have no nuclear weapons at all. But can governments all over the world agree to this proposition? Can scientists be persuaded not to do research in such areas?

I am pessimistic on both counts. Man has not yet broken the barriers of nationalism to take a world-view. Maybe in the next century the progress of communications will finally break these barriers; but today that goal seems a long way away. Equally difficult is to restrict or channel scientific research away from the dangerous areas. Especially in these days of 'big-money science' if government funding is available for such areas, it will be hard for all scientists to resist the temptation. In any case, the curiosity that killed the cat may spur the scientist to the same fate!

Conclusion

This is where man is today—on the proverbial fence. The march of science and technology will sooner rather than later force him to take some crucial decisions necessary for his survival and well-being. He cannot avert the responsiblity if he is what he claims to be: a rational being.

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