HERITAGE AND TECHNOLOGY
In Harmony Or In Conflict

(Paulos Gregorios)

The two questions recently posed by Prime Minister Rajiv Gandhi to the philosophers of India seem to merit some response. The Prime Minister, who is reported to have refused to inaugurate the Indian Science Congress, readily inaugurated the Diamond Jubilee celebration of the Indian Philosophical Congress (Hyderabad University, December 1985). In his address to the two hundred or more professional teachers of philosophy, he made it clear that there was no alternative available to India in entering the Twenty first century, except to adopt modern technology. This was necessary in order to banish poverty, ignorance and ill-health from our land, and was not a question to be debated. The questions were not about the scientific technological path versus other alternatives. He raised two questions:

(a) Is there an intrinsic conflict between the Indian heritage and a technological civilisation?

(b) If we want to keep the best values in our Indian heritage along with a technological civilisation, what are the values to be particularly cherished and encouraged?

Since Rajiv Gandhi did not himself seek to answer the first question in any detail, which he left to the philosophers to discuss, we will begin with some which he did provide. These comments are relevant to any answer to the first question.

Speaking from Rajiv Gandhi's personal experience, he gave two instances of values he regarded as specially significant to him in his work as Prime Minister. Both are derived from the Bhagavadgita. The first was that of nishkama karma, or action without desire for the fruit of the action. For him, it was important to act in the right way, outof a sense of duty and rightness, without worrying too much about how many votes the action would gain or lose, or about whether other people would applaud or deplore. Obviously our Prime Minister had acted in this way, though he himself did not say so, both in the Punjab accord and in the Assam settlement. The political losses, at least for the time being, seem to be quite heavy. Yet the issues were settled, perhaps only temporarily. And settled in such a way that the opponents of his own party gained the short term political victory.

The other value to which he referred, tracing it also to the gita, the Prime Minister put rather felicitously: "Equanimity is the better part of valor". He meant to say that in order to take courageous action in a moment of crisis, the most important need

not to be flustered. This is one quality of Rajiv Gandhi's which has been widely acclaimed - his unflappability in the face of crisis.

These two illustrations he gave from personal experience raise several questions.

The firstis, how are these values to be interpreted in our democratic context? In the Gita, the value of nishkamakarma is proposed to Arjuna the warrior in the field of battle, by his charioteer, the Lord Krishna. Arjuna faced the moral dilemma - between defending the righteous, and for that purpose, killing his own cousins and relatives in battle. The Lord's advice to him meant essentially the exhortation to do his duty as a warrior prince without worrying about who gets hurt. Can this be accepted as a value for a modern democratic state, where the will of the people seems to claim priority over what is right. Can the head of a democratic state simply take the right action without considering what the people want, and without calculating the political cost? It is true that both in the Punjab dispute and in the Assam question, the majority of Indian people approved the actions taken by the Rajiv Gandhi government, though later there were second thoughts for many. But the question remains: In a democratic state, is it possible to apply the principle of nishkamakarma, when the democratic process demands that political costs be taken into account?

If Rajiv Gandhi can demonstrate this righteous principle consistantly, he may be laying the foundations of a new rajaniti, and who knows, the people in general may support him despite a temporary loss of votes. If dharma, which is rightness of attitude and action, can thus be the basis of a democratic rajaniti, we may be opening a new chapter in political history, one that gives the lie to the principles of Machiavelli's The Prince, which now dominates politics.

About the other principle of equanimity in the face of crisis, this would not be a new principle, but is in fact the crux of western diplomacy as it is now, One need not even go into the Vedas or Epics of India to find this principle, which is fairly universally accepted, even by criminals and great deceivers.

The second question is: On what grounds does one choose certain values and reject others, from one's heritage? What is the criterion of selection? Is it just usefulness? Such an approach would be a denial of the Indian heritage. In the Gita as well as elsewhere in the Indian tradition, nishkamakarma is an integral part of Karmayoga, the way of seeking unity with the

divine through right action, without desire for its fruit. In other systems like jnanayoga, nihkamakarma is preparatory or propaideutic for seeking fulfilment through sravana, manana and nidhidhyasa, through heeding, contemplation, and disciplined meditation, as a way to seeking mukti. Can nihkamakarma be severed from its yogic contest and made a principle of political ethics, simply because one finds it useful? Why leave out sravana, manana and nidhidhyasa and accept only nishkamakarma as a principle? Are we not doing violence to the principle itself by doing so? This is not a rhetorical question, but one that needs to be discussed.

A third question is, how are these values, once chosen from our heritage, to be inculcated in the people? It is clear that the values for which Rajiv Gandhi was asking were not to be limited to the head of the administration. It must apply equally to President, Prime Minister, all ministers and government officials, as well as to all the people. Values cannot be inculcated by precept and preaching alone. Rajiv Gandhi may be justified in believing that his own example would have a multiplying or emulatory effect on the rest of the government and the people. His namesake Mahatma Gandhi showed us the extent to which this can be true and not true.

At this point there is no need to belabour the point that Rajiv Gandhi's new rajaniti will have to be assessed by future generations, not so much by its theoretical consistency as by its capacity to transform the negative ethos now prevailing both in the government and in the apparatus of the ruling political party as well as others. There will need to be more than precept and example. Can nishkamakarma or equanimity be infused in others through discipline? Perhaps yes, but this will have to be demonstrated again. How does one get these values into the present political ethics, which is dominated by the opposite principle of seeking personal and group gain even at the cost of justice and integrity? How do we bring these values into the educational system? Is it not much more difficult and demanding than introducing computers and modern technology into the school system?

II VALUES AND TECHNOLOGY

After having briefly raised some questions in relation to the values suggested by Rajiv Gandhi, we are now ready to move into the question whether there is an intrinsic conflict between the values of our Indian heritage and these of a scientific technological civilisation.

The answer to that question depends largely on our analysis of the intrinsic nature of the scientific-technological civilisation and its fundamental features. Since we cannot attempt such a comprehensive analysis here, we can only point to some select features which are relevant to our question.

First, there is need for a clarification of what we mean by modern science, technology and a scientific technological civilisation.

The philosophy of science has discovered that science cannot be defined a priori, in such a way that we can use the definition to distinguish between what is science and what is not science. Science is no longer defined as objective truth, since all scientific theories are subjective creations hypothetically proposed by the scientific observer and not directly yielded by objective reality. It is a subjective theory tested by subjective-objective praxis. Neither is science proved truth, for every scientific hypothesis has the unspoken qualification "in the light of our present knowledge, and subject to reformulation in the light of other data". Goedel's theorem has conclusively shown us, by mathematical demonstration, more than fifty years ago, that no science can be a completely self-consistent and self-opmtained system.

Quite apart from the problems of definition or demarcation criteria, and those of proof and objectivity, there is the further preliminary question about the distinction between science and technology. This is a distinction easy to maintain in theory and illustrate by example. But in practice the distinction is fading. What is known as "pure science" or scientific knowledge which is an end in itself or independent of technology is fast disappearing.

First there is the phenomenon that most of scientific research is financed by people or institutions with an interest in putting that knowledge to some technical use. Very little scientific research is pursuing knowledge for its own sake.

Second there is the fact that advanced technology is today an integral part of scientific research. Take away the electron microscope, the particle accelerator, the computer and a few

other advanced technological devices, advanced scientific research would come to a virtual stop.

Third there is the somewhat disturbing fact that at least at the micro-level, the technological measuring instrument determines the momentum or position of a particle, and knowledge of the particle independent of the technology of the measuring instrument is denied to us.

As for modern technology, it is common knowledge that it is totally dependent upon modern science, and the integral relationship between science and technology has become so extensive, that it is more useful for thinking to coin a term like "sci-tech" than to make theoretical distinctions between science and technology.

That point needs to be clarified in order to make us see that the technological civilisation we are talking about is a sci-tech civilisation, rather than just technological. In taking a look at this sci-tech civilisation, we recognize first the fact that historically it arose within European culture and that it bears the marks of its historical cultural origin. We are already seeing that the sci-tech civilisation has fundamentally altered the cultural values of the West. but also radically transforms all cultures wherever this sci-tech civilisation is introduced.

Two of these changes have to do with the process called the Enlightenment which provided the matrix within which sci-tech developed in the West. This was largely an eighteenth and nineteenth century phenomenon. Though modern science was born much before that, its great expansion and development took place in the context of the European Enlightenment which soon dominated the culture of Europe. The Enlightenment reaffirmed and highlighted the main elements of European modernity - namely the repudiation of tradition, and the affirmation of the full autonomy of human reason. Along with this came the affirmation of secular humanism as distinct from christian humanism, that man is both the measure of all things and also the potential master of all things through the proper use of reason through science and technology.

The repudiation of the authority of tradition and the exaltation of human reason as the arbiter and authority for knowledge and values, the twin principles of modernity and the European Enlightenment, effected a new revolution in human consciousness, second only to the Copernican Revolution or perhaps, in the long run, even greater in magnitude. It is the

understanding of this second revolution that could provide us with a clue to answering Rajiv Gandhi's questions.

Europe likes to see its intellectual and cultural history in three stages - medieval, renaissance and modern.

The medieval period was one in which the authority of the Roman Catholic Church was affirmed, though not always acknowledged, to be supreme in all matters of European life - political-economic, scientific-technological, moral-cultural. Here there were three realities in the world-view -

(1) god as supreme Ruler and Judge

(2) the church magisterium - not the whole church, but excluding the vast mass of ordinary believers, and with the Pope or the Bishop of Rome, as the bearer of god's authority as ruler and judge, and

(3) the ordinary saeculum with its people - the laity, the princes, nobles, the world as a whole.

It was the structure of this medieval christendom that was progressively challenged by three inter-related processes - the European Renaissance, the Protestant Reformation and the European Enlightenment or Erklaerung. The Renaissance was powered by the rediscovery of the Greek Classics; the Reformation was a repudiation of the religious authority of the Church magisterium; the Enlightenment repudiated all traditional authority including that of the christian scriptures which Protestantism has counter-posed as the source of authority. Where Protestantism affirmed the authority of the individual believer's conscience to interpret the scriptures, the Enlightenment insisted on the individual reason as the only source of all authority in all matters.

In this process, the three realities of the world-view of medieval christendom were replaced by two realities:

(1) the human person whose reason was the final authority in all matters - knowledge and values, and

(2) the world, which was to be known, understood and brought under control through sci-tech.

Though modern science began within the process of transition from the medieval to the modern world-view, it found full freedom to develop only as the Enlightenment in the 18th and 19th centuries provided the matrix of a rational world-view.

The question before India is as follows. We did not, thank god, have in India something like the medieval church claiming divine authority for one particular religion or one particular set of religious institutions. We had an extremely

pluriform culture in which not only many religions co-existed, but within each religion there was room for diverse points of view. There was also more or less full freedom for thinkers and groups of people to repudiate all religious authority and to develop secular systems of thought like the Carvaka, Lokayata, Sankhya and Baudha systems. With the advent of the Moghul Empire, our system, if any, had become even more pluralistic than before. New religious systems like the Sikh religion could arise and flourish.

The coming of the British and the impact of western intellectual systems powered a renaissance for us in the eighteenth and nineteenth centuries, more or less simultaneous with the European Enlightenment. The Enlightenment itself was rather late in comeing to India, mainly through the educational system which was based largely on western liberalism.

If there was one movement that galvanized the nation and gave us new vitality as a people, it was the freedom movement. This movement received great impetus from the socialist revolution, and by thetime we get to our national independence, the Congress party, under Nehru's leadership, had already accepted several planks of a socialist platform. Unfortunately however, these planks soon became largely verbal, as the middle class began to dominate the Congress party, throwing out most of the leftists and socialists to form separate, but largely ineffective smaller parties. Technology, such as we had, went in two different directions. One, in the public sector, helped create the basic industries related to steel, coal, rail transport, irrigation, power and food production. The other, in the private sector, concentrated on consumer goods production, largely for the fast growing middle class,

Technology created, primarily through the private sector, a new class of people, with a set of values unrelated to our heritage. Efficiency in management of production and marketing became the supreme value.

There was another factor which created new values [illegible] from the technocratic managerial system. Government had put a large plethora of controls and restrictions on the private sector and had imposed fairly high tax rates (excise, income and sales taxes) on private industry. Evading controls and restrictions and taxes became the new value of the managerial class. They were prepared to bribe, to falsify accounts, and to make large contributions to the political party in power, in order to obtain and maintain special privileges. Here begins the deterioration of the integrity of the political process.

Efficiency, one can say, is integral to the technocratic process of production and marketing of goods. Are bribery and corruption also intrinsic to the technocratic process? The answer is that it is more so in so called democracies than in disciplined socialist societies. As the political process in our so called democracy became more and more dependent on a share of the profits made by traders, manufacturers, civil contractors and defence contractors, the degree of corruption, bribery and tax evasion simply grew enormously. Was this the fault of technology? Clearly technology had a share in the disintegration of values, for they were willing to bribe politicians and officials in order to gain their ends, rather than take it to the people as they should have, in a truly democratic society. It is no comfort to say that such large scale bribery and corruption exists in the advanced industrial countries like U.S.A., Japan, West Germany and France. This simply demonstrates that ina a soft society with western liberal forms of so called democratic governments, technological civilisation does undermine the values of integrity and probity. Even in a small state like Singapore, where a disciplined society was for a while able to arrest the onslaught of bribery and corruption, the opposite trend has already begun.

The People's Republic of China, a disciplined socialist society, recently, attempted to create certain zones where foreign investment and private sector economic activity were allowed. The result was seen to be disastrous. All the old values of integrity and probity soon broke down and there was large scale bribery, corruption, smuggling, alcoholism, prostitution and all the rest.

It is reasonable to draw the conclusion that what affects values is only in part the work of technology, but in large measure the combination of private sector production and soft administration with technology.

Our Prime Minister, in his Hyderabad address, pointed to Japan as a model for India to emulate in entering a fully technological civilisation. He gave expression to the view that in Japan the technological culture had not undermined traditional Japanese cultural values. Nothing could be farther from the truth. Sensitive Japanese observers are extremely concerned about large-scale erosion of Japanese culture as a result of the introduction of a technological civilisation. We will do well to make a more thorough study of what has happened to the Japanese people and culture as a result of their wholesale adoption of western technology.

We should look briefly at two west German interpretations of what has happened to European culture before we conclude with an Indian perspective on Rajiv Gandhi's question.

The first critique is a radically negative towards science and technology, from Martin Heidegger. Heidegger has shown us how all thinking occurs within a given tradition, and the intellectual horizon opened up by it. No man or woman thinks absolutely, in the heavenly sphere of absolute truth, without presuppositions. A person can think only here and now, in the light of questions opened up by a tradition.

Heidegger opens up a new horizon for us - namely to look at the western intellectual tradition as a whole - from the Greeks to our day. His view is totally different from that of Hegel, who saw western thought, particularly Hegelian thought, as the culmination and fulfilment of all thought in all cultures and all religions of the world. Heidegger, on the other hand considers the whole western enterprise as a colossal mistake, a straying away from the truth. It is the attempt, beginning with the Greek philosophers, on the part of human persons to stand "outside" being, and to understand it objectively. Heidegger focusses on what happens to the human psyche itself in the process of development from philosophy, through science, to technology.

Let us try to be concrete in illustrating this transition, which has a great deal to do with Rajiv Gandhi's question, which is the focus of our concern in this paper. Take a mountain for example. 'Primitive man' sees the mountain as a reality with which he lives, and on which his life depends. He gives it a name - say Himalaya or Kilimanjaro or Rockies or

Andes and develops attitudes towards it - not as an object, but as a quasi-subject. He weaves it into his religious self-understanding through myth and ritual, thus entering into a relationship of reciprocity with it. The mountain impresses him and his total being responds in awe and wonder. Its majesty and grandeur speaks to his depths as an aspect of the reality in which he participates. His psyche responds, not in the scientific quest to analyse and understand, but in the deeper human response of poetry and art, myth and ritual. It is a subject which stands with him and before him, not an object which has to be understood and overpowered. The mountain is a friend, the source of the rivers that water his land and breed the fish he eats - an awesome friend, nevertheless a friend after all.

In science, the perspective changes, with consequent changes in the human psyche itself. The search is now to understand, in terms of how it came to be by geological processes, to measure its altitude, to analyze its strata and its vegetation, its mineral content and causal relation to other phenomena like rain and flood. It becomes an object for the understanding, something to be explained and described independently of its relation to us. Sometimes that relation is also studied, but not subjectively, but in the context of a presumed objectivity. Already, says Heidegger, the human psyche is alienated from the mountain in the attempt to eliminate all subjectivity in the understanding,

Then technology comes along, and the human psyche again shifts its perspective. The mountain is no longer an abject to be merely understood. The scientific understanding is <u>used</u> to visualise it as a potential resource - as a source of timber for our paper mills and furniture factories, as a deposit of mineral ore to be mined and milled for industrial purposes. The technology is then developed to <u>exploit</u> the mountain, to dominate it and make it our slave, serving our will and purpose. Even climbing the mountain becomes an act of overpowering and domination. The subject-object relation leads to a master-slave, or owner property relation.

To the scientist the mountain is "nothing but" the result of geological processes. To the industrial technologist, it is "nothing but" a resource to serve him, to be controlled and exploited by him. Here, in this transition from <u>under</u>standing to <u>over</u>-powering, there is the second alienation in the human psyche.

All this change in human attitudes is often justified and validated in religious terms in the Christian West, for

examples in terms of the god-given vocation to dominum terrae or domination of the earth, as given to Adam and Eve by their Creater. As the ecological crisis looms large, the dominum terrae doctrine is questioned and sometimes accused of being responsible for all the troubles of pollution, resource depletion, and disruption of the delicate balance which sustains the life-world or bio-sphere.

Heidegger sees the whole western intellectual-industrial enterprise as a single whole, from the post-socratic greeks to our time. The secular-scientific-technological adventure of western humanity has its roots in the original stance of greek philosophy, which unlike Socrates, stood apart from beings and questioned : Being from that stance. From Thales to our day. the western attempt has been to get at universally valid synthetic judgments about "what is really there".

According to Heidegger, philosophy certainly strays from its path when it takes a supposed stance outside the totality and seeks to understand it through synthetic inductive judgments. He would find fault with those of us who use philosophy for some kind of a cultural synthesis or 'universal philosophy' which can serve as a basis for some 'planetary culture'. Such a universal philosophy may even try to synthesize the various philosophies of the world- Chinese, Indian, African, Middle Eastern, European and Maya-Inca. But such a universal synthesis would still be a continuation of the western project to form universally valid synthetic judgments about 'what really is there'.

Philosophy's task to-day according to Heidegger is to question the very stance of separating the human consciousness/will and its objects, and of demonstrating the severe limits of verbal or conceptual language in approaching the truth. I believe this is relevant for us.

THE THOUGHT OF JUERGEN HABERMAS

The most ambitious project to find a system of universal synthetic judgments has been launched by our other German contemporary, Juergen Habermas, formerly of Frankfurt School of Social Research and the Max Planck Institute. It would indeed be audacious on my part to sketch here the main lines of this colossal system of "universal pragmatics". His main writings are new available in English, almost all published by the Beacon Press in Boston, Massachussetts. I would draw your attention especially to Knowledge and Human Interests (1968/71)[3], Theory and Practice (1971/73)[3], Legitimation Crisis (1973/75)[3] and Communication and The Evolution of Society (1976/80)[3]. A compendious summary of Habermas has been provided by Boston University's Thomas McCarthy in his The Critical Theory of Juergen Habermas (Hutchinson of London, 1978). If you find McCarthy forbidding, go to Garbis Kortian's Metacritique: The Philosophical Argument of Juergen Habermas, (Cambridge Univ.Press, 1980). Kortian is superbly lucid and penetrating.

Habermas takes a different direction from that of Heidegger. He wants to pursue a critical theory buttressed by metacritical critique of the theory itself. Habermas is anxious not only to keep theory and practice together, but also to give primacy to practice. He follows Marx's metacritique of questioning Kant's separation of pure reason and practical reason with primacy given to mind over will. He follows Marx also in rejecting Hegel's attempt to resolve contradictions in the realm of reflection rather than in social reality. But he questions Marx in his underplaying the role of reason in the emancipation of humanity.

Habermas thinks that while Hegel capitulated to metaphysics in postulating his philosophy as a universal science, Marx and the Marxists have capitulated to its latter-day counter-part, scientific positivism. In order to find out what is wrong with Hegel and Marx, Habermas goes to the antecedent Kantian critique of a threefold analysis - pure reason, the moral will,

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3 - The first date refers to the original German work, and the second to the English Translation.

and the aesthetic judgment. The Kantian critique has been substantially altered by the thought of Hegel and Marx. But the issue today is to come to terms with the phenomenally successful world of the physical sciences (Naturwissenschaften) and the human science (Geisteswissenschaften). In both areas the epistemological issue today cannot be stated in the Kantian categories which in a sense are pre-empirical. Today we should focus moreon the categories of validating or certifying knowledge, rather than on the mental process of knowing. These categories of validation cannot be the same for the physical sciences and the human sciences. Neither can either of these sciences by its own method provide or justify the categories of validation.

But epistemology itself cannot be reduced to method, as positivism tries to do. It has to reflect on the nature of reflection itself, something which positivism fails to do.

Such reflection on reflection, Habermas claims, cannot be contained within the methodological ambit of eitherthe physical sciences or the human sciences. It is a third level of investigation, which Marx wrongly tried to subsume under the category of political economy. What is now pursued as philosophy of science and philosophy of history are not simply part of the methodology of science or the historical method.

Both the physical sciences with technology arising out of them, and the human sciences with categories of moral principles of human social inter-action, have their antecedents in something pre-scientific, i.e., the question of the interests implied in all knowing. These interests are perennially human and therefore not to be left unexamined or rejected as pre-scientific.

All knowledge is bound by interests - that is the thesis of Habermas' seminal work on Knowledge and Human Interests. This interest is dual - not singular as Marx pre-supposed. Marx recognized the practical interest in all theoretical knowledge, but he interpreted that interest as exclusively instrumental. Marx was right in defining the specificity of the human as distinguished from animal as tool-making - homo faber. It is by tool-making that human beings, unlike animals which adapt themselves to the environment, began adapting the environment to their interest and purposes. It is out of this tool-making activity that human persons became interested in knowing and changing things. They saw the possibility in the

stone of becoming an axe, and proceeded to shape the stone to suit the human interest.

But this tool-making or instrumental interest was but part of the whole human interest in knowing the environment. Human persons found the environment as conditioning or confining their exitence. When confronted with the fish in the flowing stream or the running animal in the woods, human beings were unable to catch the fish or kill the animal with their bare hands. They found themselves conditioned and limited in their capacities. It was necessary to be emancipated from this limitation. Their interestin tool-making was motivated by the desire to overcome their limitations and be emancipated from the conditioning or limiting element in themselves. This emancipatory interest precedes the tool-making interest. Knowledge thus has a twin interest, instrumental as well as emancipatory, the one arising from the other. They learned the sharpness of stone and the power of the bow and the sling, in order to emancipate themselves from their own conditioned-ness.

Knowledge itself is an event in the process of material exchange (Stoffwechsel) with nature, according to Marx. But the adult male or female does not fall from the sky. The formation of a human person does not begin or proceed in a purely individualistic context.

The human child is born, helpless and dependent on others, as far example on the parents. The child is formed and comes to maturity in a double process - handling things with its mouth and hands, which is the beginning material exchange process, and the socialisation process within the family where it acquires its knowledge and skills. It does not become a person merely by material exchange, but also by social interaction with other persons - parents, siblings etc. In this process too there is a movement from dependence to autonomy or emancipation. Even the autonomy is not total; the dependence relationship in material exchange and social interaction goes side by side with the process of emancipation from material conditioning and from parental dependence.

Along with the material exchange and the social interaction arise the contradictions, not only of knowledge, but also of existence and relation, which have to be overcome or resolved. The emancipatory interest thus continues both in the material exchange and in the socialisation process, i.e., in the overcoming of contradictions in both theory and practice.

[illegible], as Hegel pointed out, was that of starting with the individual adult subjective ego and consciousness existing in isolation as a given, and not giving sufficient attention to theformative processes that gave rise to the ego and consciousness. The same mistake of starting with the adult person as a given occurs also in theology and spirituality, as in philosophy and epistemology. If we want to ground theology and spirituality in reality, we will have to take account of the formative processes that constituted the consciousness and the world, as well as of the interests and expectations of that consciousness.

TOWARDS A RECONSTRUCTION OF HUMAN FORMATION

On the basis of theforegoing analysis one can delineate three levels of human activity and knowledge, by which we form and shape ourselves

a. Science-technology
b. Political Economy
c. Culture-Meaning-Value

In each of these areas there are separate normative categories and validation criteria, all of which, in so far as they have to do with human formation, have also to do with spirituality and christian formation. In all three areas there is a constant inter-play of theory and practice. Theories are formed out of the experience of practice; theories are also to be tested and attested in practice, though the practice varies in the three spheres. In contemporary thinking these three spheres replace the three spheres of Aristotle's thinking which had suggested the three critiques of Immanuel Kant. For Aristotle, <u>theoria</u>, <u>praxis</u> and <u>poesis</u> were the three spheres - of pure contemplation or mental activity, which is what <u>theoria</u> means to him; of moral and practical action within the <u>polis</u>, which to him was <u>praxis</u> and to us political economy; <u>poesis</u> referred to the production of useful artefacts for which <u>techne</u> or the skill of cunning art was needed. In Kant the three spheres became critique of Pure Reason, critique of Practical Reason, Aesthetic judgement.

Our three spheres can only be distinguished in thought but never made independent or self-contained. They interpenetrate and condition each other. We need not debate the Marxist position that it is the developments in the foundational sphere of science-technology i.e., in the forces of production that

revolutionize and change the patterns in the super-structure of political economy and culture. That debate will lead us too far afield. Nor need we debate the positivist dogma of total separation between is and ought or fact and value. It is a dogma that stands refuted the moment we recognize the relation between knowledge and human interests.

We know today that scientific theories are themselves subjective creations, and not dictated by objective reality. Even in so-called pure science, we recognize value judgements like the requirements of elegance, simplicity and predictive power. We need not debate the false claims of positivist scientism that scientific knowledge is theonly kind of knowledge that there is, and that it is proved and completely objective knowledge. Those claims have been adequately and fairly finally repudiated[4] by reputed philosophers of science.

We can however recognize the fact that there is an emerging consensus about validating morms or criteria of confirmation in the various spheres, though even here the consensus is far from complete or equally clear in all the three spheres. The three spheres have three distinct types of logic. In the first sphere of science-technology the instrumental or operational interest dominates, though the emancipatory interest is not absent. On thevalidation criteria we still have the on-going debate between the tribes of Karl Popper, Thomas Kuhn, Paul Feyerabend, Imre Lakatos, Michael Polanyi and others.

In the realm of political economy we have no consensus on emerging criteria for validation. The two basic options of Marxist-humanist socialism, and liberal-bourgeois market economy system, with their myriad internal variations, are both now contested by Islamic ideas of theocracy and quranic law. The validation criteria of science-technology or even critical reason cannot be applied to the realm of political economy. We will simply have to accept theplurality and seek to affirm only the principles of openness of dialogue, concern for justice, peace and the dignity of the human person, and a commitment to keep the ecological crisis and the arms race from blowing up the delicate bio-sphere.

4-See for example Alan Musgrave and Imre Lakatos(eds); Criticism and the growth of knowledge Cambridge University Press, 1970 (reprinted 1976) especially p.92

When we move into the realm of culture, value and the critical unmasking of hidden interests operating in society (Ideologiekritik) we have again no certain validation norms to appeal to. The western discussion on these subjects have yeilded many precious insights, but many of the deliverances of western thought on languages, culture, the role of reason and will, thenature and destiny of the human person, the origin and nature of theuniverse, the nature of truth and beauty and the meaning of existence have led to no basic consensus even in the west, not to speak of the other cultures. Faith and unbelief, reason and revelation, religion and secularily - the list of unresolved issues goes on endlessly. As for the anti-hero of Persig's Zen and the Art of Motor-cycle Maintenance the effort to answer the age-old question: "what is the good?" Simply drives us mad.

But these remain the three basic realms in which human formation goes on. The option to escape these controversial realms and seek fulfilment in solitary meditation seems attractive but terms out to be impossible and ineffective. It is in the midst of the struggles of the three realms that human persons and societies are formed and shaped, whether in the west or in the rest of the world. The positivist quest outlined by Auguste Comte has come to grief. The hope that we can leace theology and metaphysics behind to find absolute certinly and sure ground in positive science has proved vain and hollow L'etat scientifique on positif as the final stage of the human quest for emancipation and fulfilment has turned out to be an illusion. This disillusionment is at the heart of the current malaise of western civilisation. As the philosopher Imre Lakatos of London put it,

> "Now very few philosophers or scientists still think that scientific knowledge is, or can be, proven knowledge... But few realize that with this the whole classical structure of intellectual values falls in ruins and has to be replaced" [5]

But with what shall we replace it? Juergen Habermas proposes to us a grandiose scheme of Universal Pragmatics, based on the idea of critical or meta-critical self-reflection on the three realms of human activity. Self-reflection is the

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5- Criticism and the growth of knowledge p.92

way to emancipation, says Habermas. His in an attempt to reinstate the 18th century European Enlightenment and its project of overcoming tradition, dogma and authority through the exercise of critical reason. He gives a new definition to the philosophical task by positing emancipation or liberation as the final end of philosophy, and critical reflection on praxis as the way to the tepos.

TOWARDS AN INDIAN PERSPECTIVE ON SCI-TECH TODAY

I have the personal feeling that the Heideggerian critique is of minimal interest to Indians, though it is strikingly similar to Mahatma Gandhi's sweeping critique of western civilisation. Gandhiji said:

> "This civilisation is such that one has only to be patient and it will be self-destroyed... According to the teaching of Mohammed, this would be considered as a Satanic civilisation. Hinduism calls it the Block Age or Kaliyuga" [6]

Rabindranath Tagore and Sri Aurobindo have expressed similar points of view about the inner rottenness of the civilisation that we have progressively been adopting in India. We are now in the process of taking this fatefully resolute step to a more definitely technological civilisation. There is no clarity in the minds of Indian philosophers as to what this path involves. But at this point we can say a few things, first negatively:

(1) The emphasis on <u>efficiency</u> leads to <u>depersonalisation</u>. Human feelings, concerns and interests are made secondary to achieving the matter in hand.

(2) The sci-tech approach is basically <u>not respectful to the environment</u>. If the utmost caution is not taken, not only resource depletion and environmental pollution, but basic damage to the life-sustaining system can result.

6- M.K.Gandhi, <u>Hind Swaraj</u>, Navajivan Ahmedabad, 1938.p.20

(3) The sci-tech approach shelves problems of culture and religion into a low priority box. The basic spiritual quest of humanity does not normally find a place on the agenda of a sci-tech oriented civilisation.

(4) When the sci-tech approach is set [illegible] in a market economy frame, it leads to alienation, excessive greed, acquisitiveness, and continuous erosion of human values by the powerful flow of a commodity culture.

If these four negative points are kept in mind, the values that we try to bring out of our own Indian heritage will have to counter-balance these. I suggest a few

(a) From the Vedic tradition - the concepts of Rta and yajna, cosmic order and the self-going of sacrifice.

(b) From the Buddhist tradition - the concepts of karuna (compassion) and non-dogmatism.

(c) From the Jain tradition - the practice of austerity and self-discipline;

(d) From the gita Tradition - The noble concept of nishkama-karma, or productive activity not for one's own profit, but as service to the community.

(e) From the Vedanta tradition - The great concept of the unity of all being, and based on this unity of all humanity, and a respectful attitude towards all life and all existence - so important for the environmental issue;

(f) From the Christian tradition - The concept of love as active service to all humanity in need.

(g) From the Islamic tradition- the concept of the equality of all human beings, without reference to race or caste;

(h) From the Sikh tradition - the concept of being a disciple (sikh) ready to do battle for the truth, disciplined and groomed for action .

(i) From the Secular tradition - The commitment to justice, freedom and dignity of human persons, and the spirit of free enquiry and national discussion.

These values thus listed are only illustrations. But as has been pointed out, formulating values is not the same as inculcating them. The integration of a techno-culture with traditional Indian values demands a vigilant struggle against dehumanising and depersonalizing values. The media, the educational system, the trade unions, the political partied - all will have to co-operate in the inculcation of these values in a proper and adequate way throughout our urban and rural societies. Whether such integration is possible will be shown only in that campaign. The values will have to be brought in all three levels - science-technology, political economy and philosophy-culture.

HERITAGE VERSUS TECHNOLOGY

REFLECTIONS ON THE ROLE OF TECHNOLOGY IN SHAPING THE INDIAN IDENTITY

(Paulos Mar Gregorios)

No culture today can escape the globally pervasive power of modern technology. Never before in human history has appeared such a globally pervasive power - unless it was the global atmospheric change which finished off the dinosaurs many millennia ago. A culture seeking today to keep free from technology's impact in order to preserve its purity has as much chance as the dinosaurs had then.

The reasons for this pervasive power are not far to seek. Technology creates not only instant global communication, but also its own institutions and forces, its own wants and commodities to meet those wants, its own social organisation and status symbols.

In 1985 the then Prime Minister of India, Sri Rajiv Gandhi, in his inaugural address at the Diamond Jubilee of the Indian Philosophical Congress at Hyderabad, raised the question for Indian philosophers to reflect upon: Is there any intrinisic contradiction between the new technological civilisation that India was determined to develop by the year 2000 on the one hand, and the values of India's traditional heritage on the other?

Before the philosophers could digest the question, Rajiv Gandhi proceeded to answer it from his own point of view. To him there was no such intrinsic contradiction. He pointed to Japan as a nation which had resolved the conflict between technological values and traditional Japanese values.

For those who knew something of Japan, this was a judgment hard to swallow. Japan is still in the first stage of the conflict. The decision has been to give priority to the demands of technology and management as dicisive for the economy. Culture can only be a secondary consideration, since the top priority is to beat America and Europe and become Number One as a nation. Once the technology and the economic resources

are there, the claims of culture and identity can be left to a second stage.

The Japanese have known the problem ever since the Meiji Restoration in 1867, when the westernising trend began in Japan under pressure from the Western powers. For us in India westernisation began much earlier, and under British colonial tutelage we learned to despise our own heritage in a way which the Japanese never did. And unlike the Japanese we were never at the stage where we could compete with the west in their own game of technology. The Japanese certainly show more cultural self-confidence than we in India seem capable of at present; but they too are far from having resolved the question of heritage and culture. We can learn from their experience, but they have given us no model.

Rajiv Gandhi's formula was quite simple: adopt the technological civilisation as base. and then weave into it certain values we can now pick and choose from our rich and varied heritage. He proposed two values he had found useful for himself from the Gita and the Upanishads - nishkamakarma (right action without desire for its fruits), and sthitaprajnata (keeping your cool in the face of impending catastrophe. or in his words: "unflappability is the better part of valour"). All right perhaps for Rajiv Gandhi as an individual, a technologist who had become head of the Indian state; but certainly dubious as a social value for our people harrassed by the impact of western technolgy. We need to go a bit deeper - to look at modern Science-Technology (Sci-tech) both as an enterprise and as a way of dealing with reality, and then see how these fit into the Indian identity.

SCIENCE-TECHNOLOGY AS ENTERPRISE AND COMMODITY

The Inter-dependence of Science and Technology

There was a time when it was fashionable to make a neat distinction between pure science as theoretical knowledge and technology as mere application or the applied science of engineering and technology. Pure science was conceived of as something existing in its own right, independent of whatever technology that may develop from it. The former was supposed to be distilled permanent truth, pure theory, objective and proved, while the latter was simply putting the former

to work for human purposes. I myself used to say once that science tells us how things work and technogy shows us how to work on things using the knowledge about how things work. I no longer do, for three reasons.

Pure Science (e.g., a new general theory of relativity or new attempts to formulate quantum theory beyond the Copenhagen Interpretation) has now become rare, certainly less than 5% of the total scientific/technological research being done today. Most research in science is geared to technological interests, whether that technology be medical, military, agricultural, industrial, communicational, cybernetic or other.

Secondly, scientific research today has to be corporate, since the costs and infrastructure involved are way beyond the means of the individual scientist. Gone are the days when scientific research was a job to be accomplished by the individual scientist in his or her own private backroom laboratory. It is a huge enterprise, sometimes even way beyond the means of individual governments. The new multi-million underground Particle Accelerator at the Centre Europeenne de Recherche Nucleaire near Geneva is 7 kilometers long, partly under Switzerland and partly under France, financed jointly by 14 European governments. Research in Laser Technology or Super-conductivity also has become forbiddingly expensive, even for many governments. And while a case can be made to show that some of this has no immediate commercial application, the enormous quantity of funds needed would not have been forthcoming if the governments concerned had not some hope to be economically rewarded for their efforts.

The third thing to note is that scientific research has increasingly become dependent on high technology and the independence of science from technology is now mostly a myth. Even simple biological research requires electron microscopes and other high technology equipment. Technology is no longer merely an outcome of science. There can be very little science research today without advanced technology. The two, science and technology - are inextricably intertwined, and it is better to speak of them as one reality -"sci-tech".

The Sci-Tech Colossus

And this sci-tech is today a multi-billion dollar colossal enterprise financed and controlled largely by military establishments and large transnational corporations. The main funding source for sci-tech research is today the trillion-dollar global military budget, and the corporations and contractors who benefit from that inhuman and useless budget, paid for by the sweat and toil of the working people and costing the precious life of many young people in our mad world.

Armaments expenditure gives us no added security; it only creates greater insecurity. But it decisively influences the direction of scientific research; most of our present sci-tech research aims at means for more efficient murder and destruction. One consequence is the spread of militarism in all our societies promoting greater social violence than before. The global sci-tech enterprise thus becomes the most powerful anti-human force in our societies, with its increasing subservience to war and profit. Why are we unable to develop counterforce capacity to combat this monster? Michael Raemer writing in the Worldwatch Institute's "State of the World" Report (1990) says:

> "The major barriers (to conversion to a peaceful economy) are not technical but political, ranging from the power and agendas of vested interests to the widespread misconception that military spending makes good economic sense. Military contractors have little incentive to move out of defense work: They enjoy low-risk operations, generous cost-plus contracts, and large profits. Conversion would mean a loss of power and privilege."

In addition to that, in many countries including India, defense contractors provide a good chunk of the annual as well as election-year expenditure of political parties, and reduction in defense expenditure would cut into these kickbacks: political parties not being based on the public's financial support can no longer be controlled by the public.

The myth that defense expenditure creates new jobs dies hard: in India it takes Rs. 2.5 lakhs to create one job in an Ordnance Factory; in ordinary civilian industry Rs.70,000 can create a job; and in road construction or agricultural investment it takes only Rs. 1500 to 2000 to create a new job. It is the

military-industrial system that stands in the way of solving the problem of India's colossal poverty. That league is today a colossus in India eclipsing the identity of the ordinary Indian. It is true that in India only about 3 percent of total industrial employment is in military establishments, compared to Israel's 22.6 %, USA's 11.1 % and China's 10%. But compared to Pakistan's 0.8% or Brazil's 0.7%, we are overmilitarised: besides the 3% figure does not include those employed in subsidiary undertakings serving and supplying the military.

Sci-tech and the TNCs

The progress of Sci-Tech, in rate of acceleration as well as in direction, depends heavily on investment in Research and Development. The government share in that investment is largely in the Defense sector. Most of the other investment comes from the large Corporations, both national and trans-national. The main interest of these corporations is not in the public good, but in private profit and expansion of their own power. The world's R&D budget today stands above 200 billion US dollars a year. How much of this is directed to solving the huge basic needs problems of the poor and the marginalised? There are no clear estimates on this, as far as I know. One estmate gives the figures as follows:

Defence	24%	Basic Research	15%
Space	8%	Energy	8%
Health	7%	Agriculture	3%
Transport	5%	Pollution Control	5%
Information tech	5%	Other	20%

These figures are eminently misleading. Not only is there a large military component in Space, Information Processing, Energy, Transportation and Basic Research. Even the other sectors, like health, for example, are heavily oriented towards quick profit by targetting on the rich who can pay for expensive diagnosis and treatment. What is called agricultural research is mainly in ecologically counterproductive chemical fertilisers and pesticides, and in developing and patenting high yield varieties of seed oriented to monopoly interests of seed companies.

In many countries, what passes as private industry's research, is funded by government. In the U S

A, for example, in 1977, 45.4% of private industry's research expenses in electronics and communications, was funded by the government, though the profits accrued to corporations and not to the citizens who pay for the investment. The Corporations thus benefit from the taxpayers' labour, without paying for it.

Private Industry, by its very profit-seeking nature, has to target the rich and cater to their needs first and only then to the basic needs of the poor who have much less purchasing power. And so long as the Corporations are interested in profit as primary motive for research, the direction of development in science and technology cannot favour the poor or meet their real needs.

SCIENCE AND TECHNOLOGY AS COMMODITY

The Public Character of Science Compromised

In the early days of modern science it was an article fo faith for it to have all scientific work made public, in order to promote maximum possibility for the refutation of an unreliable hypothesis. Sir Karl Popper's hypothesis that modern science itself is a body of "Conjectures and Refutations" (see his work of that title) is now refuted by the fact that today much of sci-tech knowledge is not accessible to the scientific community, for two reasons.

In one set of cases, science is 'classified' knowledge resulting from military research which the state possessing that knowledge does not want to share with the enemy or with other nations. An increasingly large number of the highest paid and most competent scientific researchers today are sworn to secrecy, because they have chosen to be employed by some defense establishment, which has extracted that unprofessional vow of secrecy as a condition of employment. The public character of science has thus been betrayed by the military research scientists.

The other betrayal is by corporations. Scientific knowledge gained by corporate industry research is kept secret, because it is the source of profit which no corporation wants to share with others. And this knowledge is then transformed into a commerci-

ally useful technology, and promptly patented, as in the case of seeds, medicines, diagnostic medical equipment and manufacturing and packaging technologies. Sci-tech thus becomes a commodity for trading in the market, on a lease or rental basis or for outright sale if the technolgy is becoming outmoded and no longer useful for the corporation which owns it. Denying and violating the article of faith about the public character of science becomes a necessity for pursuing corporate profit.

Sci-Tech as Marketable Commodity

Till the other day we used to talk about three sectors in the economy: agriculture, industry and services. Recently a fourth has been added: Information. Information means largely sci-tech information, and it is now becoming the largest sector of the market economy system; that is where most research is being concentrated, because the great demand is there and hence the bright prospect of greater profit. And who controls the market in this new and highly profitable fourth sector of the economy? Those who can afford to invest sufficiently in research to produce this new commodity called sci-tech information. At this point it becomes evident not only that sci-tech has become a commodity in the market, but also that oligopoly on sci-tech research is fast becoming the most powerful tool of exploitation of the under-privileged.

According to the UNESCO Yearbook (1982), in 1978, out of a total of 2,131,500 personnel engaged in sci-tech R&D, 88.7% was in the developed industrial conutries, while the developing countries' share (including India and China) was 11.3%. Actually more than 90% was in the developed countries, since the UNESCO did not get the figures from the USSR which are not included in the 88.7%. Moneywise, the total world R & D expenditure in 1978 was 123.074 billion U S dollars, again not including the USSR. And the developing countries' share of that ivestment was a mere 4.4 percent. In fact less than 4 percent, if the USSR expenditure is included in the total. Official figures from the USSR for 1982 are 1.43 million research scientists and research expenditure of 23.8 billion roubles.

What this reveals is that the developing countries have just enough sci-tech to be capable of absorbing the "information" that the developed countries

can sell us. We are mostly a market for the fourth sector of the economy, a market that is being furiously exploited with the consent of the money-making class in our societies, through collaboration agreements and "transfer of technolgy". Even the term "appropriate technology" belongs to this exploitative marketing system.

The poor of the world are at the mercy of those who control sci-tech, the most powerful instrument both of development and of exploitation. That instrument shapes our identity and dictates our values. It is a huge global enterprise which thrives by marketing this commodity called sci-tech. Our identities are caught in its mesh and we are no longer free to develop ourselves according to any human standards.

SCIENCE AND CULTURAL FORMATION

We have pointed to the enormous socio-economic power of science, which underlies our political economy and our global exploitative structures. We should also look at the mind-deforming power of science. This is not to detract from the great achievements and potentialities of sci-tech in itself, but to review the way it has developed in our truth-distorting world.

Modern Science has been unconsciously based on Naive Realism, or the philosophical idea that things are generally what they appear to be, and that the world can be known as it is in itself. Of course science constantly reveals hidden relations between forces, fields and things; yet, it is still about the relations among phenomena that it speaks, not about what lies behind the phenomena or at their base.

Though Quantum Mechanics has been there now as scientific theory for at least two generations, it is only now that its metaphysical implications are being fully or partly grasped by scientists and philosophers of science. Subatomic physics clearly shows that the observed object is shaped by the observer's sense-and-mind and its extension, the measuring instrument. There is no objective world out there. Neither time nor space can exist in themselves. Things are not as distinct or discreet as we once supposed. Everything is inextricably inter-connected. Naive Realism has too naive a conception of reality, which may be all right

for operational purposes, but does not depict the true character of reality-perception as a joint product of our knowing equipment and what is out there. There is ultimately no theory in science that explains reality, which seems to defy science and its methods.

As the sophisticated western liberal realises this, he quietly abandons theory, which cannot be defended, and opts for various breeds of pragmatism. This happens not only in the natural sciences, but also in politics, economics, sociology and other human sciences. Joseph Rouse, an American philosopher-sociologist of Science, has made two important points in his Knowledge and Power: Towards a Political Philosophy of Science, which are important for our reflection about science and identity. First, Modern Science is to be seen only as a field of practical activity, rather than as a theoretical endeavour. Second, the epistemological and political or power dimensions of science cannot be extricated from each other.

Rouse cites the well known American Deconstructionist Richard Rorty's Philosophy and the Mirror of Nature, to affirm that the 300 year old distinctions between science and politics, science and art, science and philosophy and even between science and religion do not any longer make sense, "though this rhetoric has formed the culture of Europe". In other words science is inextricably bound up not only with politics and economics, but also with other fields of human activity like philosophy, art and religion. If that is so, and if science is as powerful and pervasive as we have shown, then it does fundamentally affect human culture, which is an amalgam of all creative human activity.

Science gets its prestige from a myth; that its practitioners are a community of saintly and ascetic, noble people heroically pursuing truth for its own sake. The fact, however, is that the scientific community is composed of ordinary mortals like the rest of us, driven by all the passions of greed, lust for power and desire for glory, ruthless competition and even a good deal of faking. Our own ruling elite, when it talks of the `scientific temper' and `secularism' as panacea for all our ills, are simply mouthing the outdated dogmas of a defunct western liberalism.

Among western philosophers, Martin Heidegger came closest to a deeper understanding of the western enterprise of modern science. Heidegger sees modern science as the logical and final consequence of the basic western stance of standing outside nature and trying to understand it from the outside. "Science does not think", he said, adding as an afterthought, "in the way thinkers think". For Heidegger western science is the consequence of a mild panic endemic in western culture and psyche. European human dasein, according to him, is always uneasy about the `other', whether that other be person or thing. And until it dominates the other it cannot be secure. So, according to Heidegger, it creates a whole system of if-then perceptions: if the other acts this way, then act this way. If you know how it is going to act, then you can always find a way to counteract and control it.

According to Heidgger, modern science is the last stage of western humanity's forgetfulness of Being, the first two stages having been western religion and western philosophy. I have discussed this at some length in my forthcoming work A Light Too Bright, (State University of New York Press, 1991). Here I need only to point out that for Heidegger modern technology's real nature is in its defiance of that which is, forcing it to yield up its secret, so that we can use that which is, according to our own choice - to make it, as he puts it, a stand-by slave, waiting to do our bidding. Technology makes mountains and rivers as well as Nature itself our slaves, our Gestell or Standing Reserve to be utilized according to our desires. Science sets up Nature as a system of coherence of forces; technology moves in to capture it and enslave it. Technology, Heidegger says, is not a consequence of science; technology reveals the true nature of science; science came about first, but its motivation from the beginning was technology.

At this point Heidegger introduces an interesting distinction; between the 'correct' and the `true'. What sci-tech reveals is correct but not true. To find the correct may often mean losing the true. In Science, Humanity makes the universe his/her object; in technology, he/she turns it into his/her Standing Reserve. The end result is that the new Technological Humanity sees only itself wherever it looks. As Heidegger puts it:

"In this way the impression comes to prevail that everything that humanity encounters exists only insofar as it is his/her construct. This illusion gives rise in turn to one final delusion: it seems as though humanity encounters only itself...**In truth, however, precisely nowhere does humanity today encounter itself, i.e. in its true nature**". (Heidegger, The Question Concerning Technology, emphasis original, slightly edited to eliminate sexist language)

The biggest charge against sci-tech so far is that it eclipses humanity from its own view. Unless we reflect on the true nature of sci-tech and its eclipsing influence and power over our perceptions, we will not be able to use sci-tech as a human instrument for cultural creativity and for meeting genuine human needs.

T O W A R D S A C O N C L U S I O N

It seems clear that we cannot meet the basic needs of humanity and sustain our global population without the aid of some kind of science and technology. Our pre-scientific ways of production simply will not meet the need, though many Gandhians might say so. It is not a romantic retreat from sci-tech and industry that will take care of the issue. It is the colossal and uncontrolled power of the sci-tech establishment that needs to be remedied. Humanity cannot afford to simply let that establishment rule, dominate and exploit. Sci-tech has to be liberated to become a handmaid of humanity, not an oppressive dictator. It should not be allowed to shape our identity, but we should be able to use it for the proper shaping of humanity's identity, in accordance with norms wisely chosen, not by sci-tech, but by humanity itself.

That is indeed a tall order. The Colossus must be tamed and made responsive to genuine human needs. One can hardly expect the State to do that for us, since the State is everywhere part of the system and unable to change the system itself. The people have to take charge of the job of making sci-tech responsive to humanity's real needs, not the needs of corporations and defense establishments.

The first stage is creating awareness of the problem simultaneously in the community practising sci-tech and in the general public. Self-awareness and self-depiction are important elements in shaping an identity. We in India, under Jawaharlal Nehru's well-intentioned leadership, opted for a secular or western liberal identity. It does not fit our people and they are reverting to communal identities, in order to find themselves. Just as sci-tech is exploited by the power brokers of society, they are also now exploiting religion to suit their selfish ends.

Our elite leadership shows very little capacity to reflect on identity questions, except by positing narrowly communal or unfeasibly secular identities. Neither Hindutva nor the much-vaunted Secularism can help solve the problem of Indian Identity. Both are equally repudiations of the noble humanist heritage that is ours. Not the humanism of western liberalism, which is without foundation, but the noble humanism of the Buddha and the Gita, of the Koran and the Bible, of the Guru Granth Saheb and the Zendavesta.

But that humanism has to be freshly formulated to fit our pluralist context; it cannot be a rehash of the superficial humanism which has developed in the west, and which is now known to be without proper foundation. It will not be either a secular humanism or a scientific humanism; the latter too has now proved itself to be without foundation and is in process of reformulation. We can learn from all, but the foundations must be laid deep into our own rich and varied Indian tradition, which is certainly not Hindutva.

If this identity is to fit India's psyche, it must have a transcendent basis without being parochial or divisive. It cannot ignore sci-tech, but must be capable of going beyond it. What is even more important, sci-tech must be liberated from its bondage to war and profit, and from its false pretenses to be the only way of knowing and doing.

The natural and social sciences must enter into profound dialogue with art and philosophy, music and literature, but also with the religions, for science has no monopoly of truth and technology has no monopoly on the right way to act. Perhaps while all this exercise is going on, there must be a simultaneous

effort to eliminate war, to enforce justice both within and among nations, and to maintain an environment fostering life. It is precisely in the context of seeking remedies for war, injustice and environmental disruption that humanity can also seek to go beyond these to find a human identity.

There is nothing sacrosanct about Indianness. If it is not at the same time humanness, it is worthless. National boundaries, whether they be of India, the U S A, or the Soviet Union, are mere historical accidents and have no absolute value. But they are temporarily necessary, because we are not yet secure about the larger human identity, and have to stick to more manageable smaller identities, whether national or regional. But these latter should in no wise be absolutised. They should be held in the framework of belonging to a common humanity, a mutually responsible global human community of nations.

At the same time if even the national identity is parochialised (as in the past the USA and many European nations thought of themselves in terms of a White identity, and many Islamic nations still think of themselves in terms of Muslim identity) and made exclusive of minorities, havoc will result. No single religious tradition can be imposed on a nation like ours. But neither can the secular scientific identity chosen by our leadership of yesterday be imposed on our people. Sci-tech and secularism cannot define or determine our identity. Sci-tech can serve, when it is liberated. Secularism can only be the choice of a few.

We need sci-tech. Without it we will make our people die. But it cannot be allowed to become the master or the shaper of our identity. This is possible only when two preliminary conditions are in process of fulfilment: (a) the establishment of just, peaceful and ecologically sound societies; and (b) the creation of a deeper awareness of the true nature of science and technology as enterprise, as commodity, and as reality-distorter, among our common people, among our sci-tech and industrial community, and hopefully among our political leadership.

SCIENCE, TECHNOLOGY AND THE FUTURE OF HUMANITY.

Some Questions for Reflection.

(Dr. Paul Gregorios)

1. Modern science, and the technology based on it, are comparatively new in the history of humanity - only a few centuries old. Science had once to fight for survival against the unjust onslaughts of a dogmatic western religion. That period is now happily over. Science has now come of age, and can stand on its own, not seeking any protection or promotion from religious circles.

2. On the other hand, Science itself had been tempted, especially in the light of some of her more spectacular achievements of the ned of the last century, to claim certain dogmatic certainties for herself. But as our century draws to its close, dogmatic scientism becomes increasingly out-dated and unfashionable.

3. Today one notes at least four different attitudes to Science and Technology occupying the centre of the stage.

a) First comes the popular view about science and technology, a view which is a kind of hang-over from the hectic days of triumphaeistic scientism. This is the belief, widely held, that science and technologyare potentially capable of solving all the problems of mankind. This naive view is especially common in the developing countries of the world, where the wise use of modern science and technology is comparatively new, and the marvels of science and technology can still make a great impression on the minds of ordinary people. I think this view is still rather common in India.

b) On the opposite extreme, and almost totally irrational is the view of the Counter-culture Syndrome in advanced industrial societies. Theodore Roszak, for example (Where The Wasteland Ends, The Making of a Counter Culture)says: "Because science dominates the reality game of high industrial society, I am convinced that a hard critique of its Psychology now as everything to do with restoring our cultural health". (Wasteland, P.371) Acknowledging his debt to such contemporary thinkers as Abraham Maslow (Solution proposed: 'hierarchical integration' of many modes of knowing, including those of Tao and Zen as well as the scientific), Lewis Mumford (a science based on "an organic world-picture), Lancelot Law Whyte (integration

of art, ethics and natural philosophy within a 'science of form' Thomas Blackburn (integrate sense-experience, intuition and objectivity on a complementarity model), Arthur Koestler (anti-reductionist emphasis on wholes and systems), and others, Roszak charges that

> "science is far too narrowly grounded in the personality. It closes out too much experience and in this way drastically distorts what it studies" (Wasteland, P.372).

His view is that "science has been lionized out of all proportion by the necessities of urban-industrial life and by the political opportunism of the technocracy". Roszak's solution is the "rhapsodic intellect", in which science is wedded to mysticism and art to produce a resolution of consciousness which restores the "sacramental vision of nature" to Science. But this revolution

> "will happen, perversely and heretically at the fringes of our culture and work its way in toward the center. The Scientists, the guardians of single vision in urban-industrial society and the intellectual linch-pin of the technocracy, may be among the last to hear the news"(ibid.p.378)

c) A third type of view comes from English-speaking philosophers of science. Despite the wide divergence among them, there is growing consensus among Karl Popper and Thomas Kuhn, Paul Feyerabend and Stepehn Toulmin. While Popper argues for the autonomy of a "third world" of man-made ideas called scientific knowledge constantly in process of revision and evolution (Objective Knowledge: An Evolutionary Approach, OUP. 1972), Feyerabend argues for epistemological anarchism in science (Against Method, New Left Books, 1974). The second edition of Thomas Kuhn's Structure of Scientific Revolutions (with an added postscript) came out in 1970 (Chicago University Press) with his theory of paradigms further refined. Kuhn sees science as a 'way of seeing' through paradigms or picture-analogies, the paradigms themselves being in a process of constant revision and change, change not in accordance with any rational law, but lamost haphazardly, often by revolution, most of the time through battles between rival paradigms created by Wcongeries of specialists' communities" (See Imre Lakatos and Alan Musgrave, Ed., Criticism and the Growth of Knowledge. (p.253) Science is a system of theory choices, preference being for theories or paradigms with greater accuracy, scope, simplicity and fruitfulness. But these are not the only

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criteria for theory choice, which seems to demands also some free creativity, ie. an irrational element as well.

All these philosophers, however, agree on one point - Science is not proven knowledge; it is one way of seeing reality, quite a successful way, admittedly. But no thinking person would claim infallibility for science, nor would be give it any methodological monopoly over human knowledge. Science is a useful tool, it helps us to predict certain aspects of reality and therefore to control them. It may also help us partially to understand the nature of reality, but cannot give us an adequate picture of it. Such a modest evalution of science seems to be the one prevalent among most philosophers of science.

d) A fourth view of science is the one held in most socialist countries. It is difficult at the moment to document this view from primary sources, since western language sources are scanty. One of the best recent western studies in Loren R.Graham's Science and Philosophy in the Soviet Union.(Vintage Books, New York, 2nd ed.1971,584 pp) What we see here is a science-based natural philosophy. Marxist ideology itself claims to be the science of dialectical materialism, a scientific analysis of social reality. Graham calls "contemporary Soviet dialectical materialism"....."an impressive intellectual achievement"(p. 430). His praise, - and let me add that the American Professor Graham is no Marxist or Marxist sympathizer, - is rather fulsome:

> "In terms of universality and degree of development, the dialectical materialist explanation of nature has no competitors among modern systems of thought. Indeed, one would have to jump centuries, to the Aristotelian scheme of a natural order or to Cartesian mechanical philosophy, to find a system based on nature that could rival dialectical materialism in the refinement of its development and the wholeness of its fabric" (op.cit.p.430)

In other words the Marxist effort to integrate philosophy with science has no contemporary parallel in the West, where the two are kept in fairly watertight compartments even by many philosophers of science. One may question some of the assumptions of Sovient dialectical materialism but its rigorous effort to build an integral system that unites ideology, philosophy and science is more impressive than any other. But this also means that Eastern European scientists and philosophers of science do not share the uncertainty about science and

technology so characteristic of the contemporary western scientific thinkers. The west feels tempted to call the Soviet attitude 'Scientism' - the belief in the omni-competence of science. The Eastern European would deny that the epithet is merited. He would say that Marxism is the only ideology that integrates science in a larger framework that deals with all aspects of reality. It is a flexible ideology, which can give up a strict Laplacean type of determinism in the light of the insights of modern physics, but stricks on to causality despite indeterminacy at certain levels.

It is not a mere platitude to say that all these four views must contain some element of truth, though the degree of verity in each may be different. The third view which is the view of most thinking scientists outside the socialist world today, could be considered more modest and objective than the first or the second; but it does not raise the question of the role of science in the sum-total of human endeavour. It is that question that increasingly rises before us as western civilization itself goes through a measure of soul-searching and self-criticism.

The main point of this paper is to sharpen the articulation of this question and some related ones. Some of these questions are:

1. What degree of regularity and determinacy has to be assumed in reality in order to explain the fact that science has been 'successful'?

2. Does science provide objective knowledge of reality? Does the fact that at certain micro levels the observer is inescapably influencing the structure of the reality observed, lead to the conclusion that in all scientific knowledge pure objectivity is unattainable? What kind of objectivity does science provide? To what extent is the claim to objectivity questionable?

3. It has often been assumed that Science and Technology are by their very nature universal, which culture is by nature local. Can this view be sustained? How is modern science and science -based technology related to Western culture, and at what points do we need to beware of this relation in adapting modern science and technology to our needs in india? (This question is much wider than the issue of small, medium or appropriate technology).

4. On the one hand, it is charged that the classical Vedanta tradition which denies any ultimate significance to historical and material reality is inimical to the development of modern science and technology in India.

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On the other hand, it is being argued that the view of reality disclosed in modern physics is much closer to the world-view of Taoism, Buddhism and Hinduism than to West Asian religion like Judaism, Christianity and Islam (eg. Fritjof Capra, The Tao of Physics).

What is the truth in either of these assertions?

5. Science can promote certain values like integrity, honesty, clarity, etc. But most of the value questions facing society lie outside the purview of science as such. Some questions in scientific investigation are themselves not capable of scientific solutions. (eg.What degree of risk are we justified in taking in connection with experiments invovling genetic mutation, and creation of new bacteria strains?) How does society make sure that the work of the scientist is itself subject to values and norms decided upon by society?.

6. Development of the scientific consciousness has been alleged to be detrimental to the development of the faculties like intuitiveness, aesthetic sensitivity, vision of the whole of reality, etc. In there any truth in this allegation; Have we over-valued science and technology because of their phenomenal success in the recent past? How do we correct this imbalance, and devote greater attention to the development of the other faculties of the human person?

7. Science tells us very little about the quality of life. And it is being increasingly realized that a higher quality of life should be a permanent orientation in all economic and social planning. Can Science play any role in quantifying or 'functionalising' Quality of Life in such a way that it can be programmed into national planning? What indicators or parameters of Quality of Life are available for this purpose?

8. Research in Science and Technology usually finds funds mainly from two sources - defence establishments and large corporations. The interest of the former is in military technology and that of the latter in fairly quick profit. How can society ensure that research funds are available for scientific projects that genuinely promote human quality of life apart from defence utility or commercial profit?

9. Is it not a luxury for us in a country like India where 60% of our people still do not have a dignified human standard of living, to worry about the long-term cultural and spiritual consequences of adopting modern science and technology, since we have no other instrument available for removing that poverty? On the other hand, once you have taken the option to follow the road of science and technology and

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Technology With A Human Face

Some questions to be faced in fashioning the future

Dr. POULOS MAR GREGORIOS *

The achievements of modern science and technology are truely enormous. They raise some major questions for humanity and its future

In this Essay, we shall pick up three clusters of such questions all of which have some ethical import: (*a*) two examples of decisions-making in science and technology; (*b*) the problem of the kind of society in which science develops; and (*c*) science as a problematic human instrument for fashioning the future. There seems to be no fully scientific method by which we can arrive at a satisfactory answer to many of these questions.

Decision-making in Science and Technology

Peaceful Uses of Nuclear Energy

Let us take two examples to illustrate this cluster of problems: the peaceful use of nuclear energy, and genetic engineering, or the manipulation of living organisms. Both, as we shall soon see, are really live issues for us in India, though the general public is only just beginning to awaken to the importance of these questions.

India has embarked on a determined programme for the peaceful uses of nuclear energy. There are two aspects to this. First, that of peaceful nuclear explosions, which we shall not discuss here.

What we need to discuss are problems raised by our nuclear power projects in Tarapur, Rana Pratap Garh, Kalpakkam and Narora. Only in Tarapur do we use enriched uranium as fuel and therefore have to depend on the Americans with all the attendant problems that Carter and Morarji once discussed in that famous private conversation some years ago, problems which have not yet been settled. In the Rajasthan, Madras and U.P. projects we use natural uranium, enriched by 'moderators', or materials with light nuclei (like ordinary water, or heavy water in which the hydrogen is deuterium;, i. e., hydrogen with one proton and one neutron in its nucleus, rather than the single neutron nucleus of ordinary hydrogen) which can absorb fast neutrons emitted by radioactive materials and slow them down to thermal energy which is what is needed in reactors.

Now what is the problem? To put it briefly: the whole fuel cycle is full of problems, mainly radiation hazards. The mining of uranium ore, production of the yellow cake, disposal of the tailings left after production of the yellow cake (usually about 100 times as voluminous as the cake itself), the liquid waste from the caking process-all these are full of radioactive hazards. Many of the buildings in Colorado are still dangerous, because their basements are filled with trailings-sand. Just the ordinary functioning of a nuclear reactor lead to a lot of radioactivity escaping into the biosphere. Chief among these, argon-41, fortunately has a half-life of only some two hours. Impurities in the cladding, around the fuel rod, may also lead to radiation leaks. Iodine-131, often leaked by reactors and released in large quantities by the fall-out from atmospheric test explosions, is exceedingly dangerous. Its half life is eight days; enough to be absorbed by the grass and so into cows and through cows' milk into humans. And hence the risk of blood cancer in both children and adults. Dr. E. Sternglass, Professor of Radiation Physics at the University of Pittsburgh, read a paper in 1969 at a symposium sponsored by the US Atomic Energy Commission, which stated that some 400,000 infants less

* *This is an abridged version of an essay by Metropolitan Paulos Mar Gregorios of Delhi who led the seminar on the subject in January 1989 at Trivandrum.*

than a year old, had probably died as a result of nuclear fall-out between 1950 and 1965.

The used fuel-rods are the most dangerous; they have to be disposed of or re-processed. At the British Windscale nuclear reactor, about 600 cubic metres of highly radioactive waste had been stored by the end of 1974. In the USA, the Hanford Reservation in Washington State had 250,000 cubic metres of high-level radioactive waste stored in ordinary steel tanks. More than a dozen leaks have already occurred. A leak in the large tank (No. 106 T) released approximately 435,000 litres of highly radioactive liquid into the earth before the Atomic Energy Commission (AEC) and its subcontractors decided to empty the tank into other tanks. This liquid contained 40,000 curies of Caesium-137, 14,000 curies of Strontium-90, as well as some plutonium. Most of this would have already reached ground-water levels and contaminated the water people use.

Even without leaks developing, some of these tanks, which are made of concrete with an inner lining of steel or glass. can last only a few dozen years. Strontium-90 has a half-life of 28 years. This means that Strontium remains dangerously radioactive for at least 300 years. Plutonium has a half-life of 24,400 years.

New techniques of leak-proof storing have been devised in the last few years. But waste management continues to be a problem, though experts, including our own in India, are loathe to admit this. Whatever the experts may say, people know enough about the accidents that took place on 3-mile Island in Pennsylvania (two in 1979 and one in 1980), not to fully trust the experts.

If a future has to be fashioned for mankind, one which is not hellish, we will have to do something about nuclear testing, nuclear arms manufacture and its use, and even about the use of nuclear power for peaceful purposes. To my knowledge, no scientific demonstration has proved that the increase in the incidence of cancer in our time is not caused, at least in part, by nuclear fallout and leaks. For the educated layman such an investigation seems necessary, though it is difficult to devise conclusive tests.

In India we have marched boldly forward in the construction of nuclear reactors, leaving it largely to the experts to worry about the ensuing hazards. There has been no public debate, nor a significant nuclear protest movement. The people are largely uninformed about the hazards of reactor accidents and of fuel waste-disposal.

We know little about the huge Windscale accident in the UK where one plant burned down, another had to be closed, and both entombed. What do we know about the military nuclear power Plant accident in Idaho in 1961, when the whole plant exploded releasing lethal levels of radioactivity, killing instantly several Americans ? Or about the accident the Enrico Fermi Plant in Detroit in 1963 which led to its shut down? Why did Switzerland shut down its Lucens reactor in 1969, when operations were at full steam for only a few months? The answer is: because of a major accident in the cooling system. What happened at the West German power station of Wuergassen on 12 April 1972 ? Again, a valve failure in the cooling system caused an accident which led to its closure.

Someone should collect the nuclear folklore of the last two decades, in order that we may better understand why there is a virtual nuclear power moratorium in the USA and Sweden, and also in order to see how we, in India, are fashionig our own future.

Someone should also tell us more about Plutonium the new-made element, which so far as we know does not exist in nature. It was first created by Glenn Seaborg and his colleagues around 1940 at the University of California. Today P^{239} is everywere, used or produced in reactors and nuclear weapons. The Rocky Flats fire in Colorado (1969) caused by the self-ignition of two tons plutonium in Building 776-777 has made people very wary. The immediate loss was estimated at $ 65 million. Plutonium had been released into the surrounding air, earth and water. One microgram of plutonium entering the human lung can cause lung cancer. Two tons of plutonium is enough to kill two billion of the world's four billion people, or half the world's population.

This raises three basic questions:

1. Do we have the right to play with such highly toxic materials which may endanger the health of people all over world now and for many generations to come?
2. Are we taking the option for using nuclear energy after due consideration of all the factors involved?
3. Do we leave such matters to the experts, or should the public be directly and actively involved in informed decision-making?

Can Science answer these questions?

Genetic Mutation

The second example that I would like to offer in the problem of decision making in science concerns genetic engineeing. Ever since 1953 when James Watson and Francis Crick gave us the structural analysis of the compounds which form DNA (the master molecule in most genes), and Noble Laureate Har Gobind Khorana created a biologically active synthetic gene, humanity has been confronted with enormous power, the power to alter the basic structure of all living beings.

It is this capacity for gene mutation which gave us the green revolution with its high-yield variety of seeds. It is this technology which led to the interesting case of Anand Chakraborty developing an oil-eating bacterium for the General Electric Company in the US.A patent was then applied for in 1972; but this has been contested in the US courts for the last eight years. It was only on 16 June 1980, that the US Supreme Court ruled by a majority of five against four, that man-made organisms like bacteria can be patented.

In principle, it is possible to produce in the laboratory a bacterium against which humantity has no resistance. You can then patent it under some pretext, you can store it and later use it for blackmail. sabotage and so on.

In the USA plant seeds can also be patented. Seed companies have been creating new high-yield or disease-resisting seed varieties by genetic mutation. In Britiain, for example, if a seed company has a plot of high-yield tomatoes, then people living in the neighbourhood are forbiden by law to grow any other variety of tomatoe in their back yards, ostensibly to protect the seed company's tomatoes from miscegenation. The fine for growing an outlawed variety of tomatoes can be as high as £ 400 !

Biologist Garrison Wilkes in an article published in the *Bulletin of Atomic Scientists* (1977) expressed the fear that traditional varieties of vegetable and foodgrains may disappear through lack of use. Dr. Erna Bennett of the FAO in Rome also estimates that by 1991 "fully three-quarters of all the vegetable varieties now grown in Europe will be extinct due to the attempt to enforce patenting laws." More recently, *The Washington Post* wrote an editorial on the 'Seeds of Trouble', which said that farmers around the world are planting fewer and fewer

varieties of crop. This decrease in genetic diversity may make crops more vulnerable to pests as well as to climatic changes and we may, as a result, face catastrophic famines in the future.

What is more worrying is that the big transnationals are buying up the seed companies. Soon, companies such as Union Carbide, Shell, Pfizer, Ciba-Geigy, Purex, Upjohn, Sandoz, etc., may have a virtual monopoly on plant seeds.

These are all problems which scientists cannot solve by themselves. We cannot fashion the future unless ordinary people like us can begin to inform ourselves and insist that decisions taken nationally, as well as internationally, are conducive to human justice and human freedom.

Science and Society

A UNESCO study estimated that, in 1974, global expenditure on Research and Development amounted to 101,785 milion of which only 2.6 per cent was spent in the developed countries.

Science develops in this loaded international science-technology order: those who have, can have more and more. Those who do not, will have less and less. The UN Conference on Science and Technology for Development, held in Vienna in the summer of 1979, failed to propose any real solutions. It could only call for the establishment of a 250 million R & D assistance fund for developing countries, to set right a gap of $ 96,500 million per year.

To put it another way: in a society *where injustice dominates, science and* technology instead of becoming instruments for the eradication of injustice have become efficient tools for further exploitation and a more deep-seated injustice. This is true both internationally and intra-nationally. Science and technology are not automatically and inherently good. If society is badly structured then science can become an enemy of the poor, the powerless and the exploited.

The manipulation of economic theory is another way in which science is used to perpetuate a situation of exploitation-domination. The best recent example is Miton Friedman's book *Free to Choose.* Friedman sees inflation as the central problem of the economy and blames the government for printing too many currency notes. It is a simple theory: when there is more money printed than the value of goods produced, then the currency loses its value, or, prices increase in terms of the value of the currency.

But why does the government print more money? According to Friedman, it dose so for three reasons: rapid growth in government spending; government's policy of full employment; and the attempt by the Federal Reserve System to control credit supply by regulating interest rates rather than by curtailing the supply of currency. His solution is equally simple. I quote: "Just as an excessive increase in the quantity of money is the one and only important cause of inflation, so a reduction in the rate of monetary growth is the one and only cure for inflation." Of course, Friedman also admits that cutting down currency supply, and therefore a trimming of all deficit budgets and excessive government spending, will reduce the rate of growth and increase unemployment.

Economic theory, masquerading as science, has a great capacity for hoodwinking not only poor consumers like *ourselves,* but also the planners of our economy. Our prevailing liberal-scientific economic theories, whether neo-classical or neo-Keynesian, contain ideological assumptions that distort the truth. To cite some points, as a non-economist, I would mention the following:

1. The growth-assumption or the non-growth assumption, i. e., either 'more is better' or 'enough is best' (as in Steady State Economics).

2. The 'invisible hand' theory which makes the assumption-though mitigated by Keynesian recognition of governmental monetary and fiscal action as a necessary regulating factor-that justice need not be built into economic theory.

3. The "value-free assumption" that economics can be developed as a science quite independent of politics which is the science of power distribution e.g. the assumption that the important factors are inputs-outputs or prices and wages, or inflation and employment or such value-free measurable entities.

4. The assumption that justice will automatically follow the increase of total production, without worrying too much about the distributional and organizational factors at the production stage.

5. The failure to recognize the fact that organized social labour is itself an epistemological category, powerfully influencing our perception of what is wrong and what needs to be done.

The net result is that we propagate pernicious economic ignorance even among our intellectuals who are trained in economics. Economics as a science then stands in the way of economic planners proposing what is really necessary for a radical alteration of the social and political organization of human activity in order to reduce injustice and promote human welfare.

Economic science becomes, thus, an ideological tool of the exploiting classes; the rest of society is unable to trust its experts.

Science and Culture

The third cluster of issues has to do with the role modern science plays in our approach to reality and in our creation of culture. Modern science has replaced medieval religion not only in Europe, but also to a significant extent in India. Among the educated urban elite of our country, science, or the opinion of reputed scientists, has the power to influence both intellectual and spiritual authority. Especially after the launching of Rohini, the prestige of science has also sky-rocketed, if you will pardon the pun. In very complex issues like nuclear power, or the Silent Valley Project in Kerala, educated people are only too prone to 'leave it to the experts'.

The myth that scientific knowledge is 'proved' and 'objective' has been exploded in the West. Scientific positivism may still be the structure upon which the thinking of many scientists and non-scientists rests. But as an intellectual position it has now been acknowledged by the best minds in the West, to be invalid.

In the English speaking West, the breakdown of positivism in all its forms has generated widespread despondency about the attainability of truth and has induced a general lack of confidence in the power of science to be the final arbiter of truth. There is a gnawing despair at the heart of Western civilization, felt only by sensitive people, about the future of a civilization based on the proven, mistaken assumption that science and technology could deal with all possible issues of knowledge and actual operation. Until recently, what was scientifically demonstrated was alone regarded as 'truth'. But today two propositions, expressed by philosophers, seers, poets and literary figures and very seldom by scientists themselves, lie buried in the Western subconscious. These are:

1. Science cannot lead us to the ultimate truth for which we thirst and which alone can give us certainty, stability and security.

2. There seems to be no alternative to our kind of science, for arriving at the meaningful and valid truth, *in our operations on the objective material world.*

This pervasive doubt about the ultimate validity of science is not shared by the Marxist world of scientific and philosophical thought. If there is a largely credible variety of Scientism going, then, one finds it only in the Marxist world. It is credible because it is not, as in Western positivism, obsessed with the ridiculous idea of an objectivity free from any trace of subjectivity. The Marxist philosophy of science has from the start, or at least beginning with Lenin, recognized the element of subjectivity in all knowledge. Marxism only refuted the Hegelian idealist principle, in turn based on Plato, that Consciousness or Ideas alone were real; Engels, for instance, rejected all notions of mentalism or solipsism. The Marxists insisted that the external world 'out there' is not a creation of man's mind: it is 'there'—'objectively'.

The fundamental question in Marxism concerns the relation between the reality of sensations, concepts and ideas which we experience, and the reality that supposedly exists 'out there'. In other words, it concerns the relationship between the subjective experience of reality and the objectively existing reality. 'Knowledge reflects the objects; this means that the subject creates forms of thought that are ultimately determined by the nature, properties and laws of the given object, that is to say the content of knowledge is objective.' Marxism thus defends scientific knowledge as objective because it is a reflection in man's subjective consciousness of an objective material reality.

This position gives rise to two difficulties: first, it is not scientifically demonstrable; second, it is inconsistent with certain other affirmations of Marxist philosophy.

The problem of undemonstrability arises primarily from the present limits of our knowledge. That range, in terms of magnitude, is of objects of the size of 10^{-14} to 10^{-28} cm. This is indeed a prodigious range, but it is not infinite.

According to Marxism, material reality is not only self-existent and eternal but also infinite. (Incidentally, religious people say something similar about God). If reality is infinite and if we know that only a finite part of it(10^{-14} to 10^{28} cm) is now reflected in our consciousness,then, how can we, based on our limited knowledge of this finite range, pronounce judgement on the nature of the whole of reality ?

The problem of inconsistency in Marxist thought arises because of the insistence on the one hand, that material reality is infinite and that it is a single-law governed system, and on the other, that in this system where all parts interact with each other the speed of such interactions cannot exceed 'C', the speed of light. The fact (if it is one) that, within our range of knowledge, 'C' is *not* exceeded would not by itself be adequate for postulating 'C' as a strict upper limit for the whole of reality. Quité apart from the theory of tachyons (particles that move faster than light), in an infinite system, if its parts are fully to interact, the speed of reaction will also have to be infinite. How otherwise can two infinitely distant parts act and react with each other at a finite speed?

If he is honest, the religious person cannot claim to have answers to all these questions. Nor does he want to use the gaps in our knowledge in order to legitimize religious belief and practice. What he objects to is the habit of making absolute *scientific* judgments based on very partial knowledge. The honest, religious person does not claim that his understanding of reality is *scientific* in the sense that it is established by the canons of

knowledge today that prices

established scientific method. What he would insist upon as his fundamental human right is, simply, that he should not be bull-dozed by any dogmatism that masquerades as scientific certainty.

This insistence by the informed religious person has great relevance to the issues of fashioning a future, a relevance that can only be alluded to here. The concept of a 'secular state', imported from the West, is a historically conditioned one; it arose in the context of a revolt against the religious authority of the medieval Roman Catholic Church which in its time dominated all civil and cultural institutions in Europe. The early positivistic as well as the more recent post-positivistic, or critical-rational approaches to secular reality in Western liberalism, as well as the overly dogmatic ontology of social being in Marxism, are creations of that cultural milieu. While these are useful for us up to a point, they cannot be decisive either for the fashioning of our national future in India or the kind of contribution India could make to the fashioning of the future of humanity.

The least one can do is to promote conversations at sufficiently deep, scientific and competent level among proponents of (1) the secular western liberal view, (2) the marxist view and (3) the informed, honest religious view, in order to see how all three proponents, from their different perspectives, can jointly contribute to the fashioning of a future in the process of which they might, perhaps, be refashioned themselves.

Smt. Nalini Nayak is engaged in the research side o
Programme of Community Organisation, (PCD) in Tr
One-Day seminar of the CSCCSC on 12 January 1989