WESTERN SCIENCE & TECHNOLOGY IN NON-WESTERN CULTURES*

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INTRODUCTION

Cultural heritage is as old and universal as mankind. Ideas and artifacts have been created and moved about within and between different culture areas even before recorded history. The older cultures have had more time than younger ones to generate ideas, but cultural age has not always been a plus point for social growth. A feeling of permanence and a heavy load of traditions can lead to inertia.

Science and technology (S&T) are parts of culture, albeit, the fastest moving parts at present. The phenomenon of cultural lag whereby scientific/technical change outstrips socio-cultural/political change is now well recognized. It is sometimes argued that long term human progress is possible only when these two processes of change--scientific/technical and socio-cultural/political--are synchronic and symbiotic, which has not always been the case. The mismatch between the two is actually growing wider as the rate of scientific and technological change keeps on increasing exponentially, sometimes causing serious disruptions in society: moral crises, breakdown of established social institutions and relationships, misapplication of scientific knowledge negating nature and civilization. At the same time, in certain other situations, a different type of mismatch is also visible: scientific and technological advances for betterment of the human condition have been hampered by backwardness and rigidities of the socio-cultural order.

SOME CRITICAL ISSUES

The new nations of Asia, Africa and Latin America have been experimenting for some time with Western S&T as tools of modernization and rapid social and economic transformation. In the Asian region, the experiences of China, Japan and India during the post-World War

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II period are noteworthy, for they offer three distinct approaches to using Western S&T in combination with local traditions and resources and achieving different results. An observer of comparative social systems once noted in a lighter vein that contemporary Japan commercializes experience and achieves results, China massifies it and makes revolutions, while India mystifies everything and reaches nirvana. Can this be said of S&T in the three societies as well?

That Western S&T have played a dominant but differential role in the recent development history of these countries cannot be denied. Whereas Japan has followed what may be called the capitalist approach, China depicts a pure type of the so-called socialistic model with several clearly identifiable ideological phases affecting her policy for S&T and their external relations without substantially altering the basic premises. The Indian S&T system, like Indian society, economy and policy, is a mixed case embodying certain features of both the capitalistic and socialistic models in an inconsistent manner.[1] These approaches are clearly discernible in the manner and mode of organization, management, adoption, development and diffusion of Western science and technology in Japan, China and India.

A critical assessment of conceptual and empirical validity of these approaches/models and their societal implications at the highest levels of generality can pave the way for a more precise micro-level comparative analysis of interaction of Western science with traditional cultures. Combined, the two-level analyses may indicate convergence or divergence of these models, suggesting viable alternative ways for Asian societies to absorb, develop and utilize the best of available scientific and technical knowledge to meet local needs without much socio-cultural resistance and/or distortions and dehumanization. Such an outcome could have far-reaching policy implications for growth and survival with decency of not only the Asian countries but the entire Third World, where developing advanced scientific and technological capabilities has become as important as preserving certain traditional structures and cultures now threatened by Western influences.

The notion of Western science as used here is not to deny the many non-Western roots of science but to delineate a distinct phase in the history of science (and technology) and the accompanying social and cultural dynamics stretching over roughly the last 300 years. That the Western S&T so identified have dominated world history for about this period of time cannot be denied. What is not clearly understood are the dynamics behind such domination, the set of circumstances which might have been responsible for the tilt in favour of Western cultures or the handicaps generated during this phase for otherwise highly robust and vibrant non-Western cultures.

This second mega-issue raises a number of other highly critical issues with far-reaching implications for the development of modern S&T in Third World societies today, the most important among these being the continuing domination of Western science, the extent of

its alienation from non-Western cultural traditions, and prospects of socio-economic growth in non-Western cultural societies with or without Western S&T.

How society and culture affect the direction, rate of development and application of S&T is not understood very precisely. The third set of issues posed here, therefore, relates to differential absorption and further development and applications of Western S&T in non-Western culture areas in the recent past, say fifty to one hundred years; and identification of factors--socio-cultural, economic and political--which might explain these quantitative and qualitative differences. Here, S&T are seen dependent upon certain macro-and micro-environmental variables.

The fourth set implies a reverse relationship: the impact of Western S&T on non-Western societies in terms of various types of impacts--socio-cultural, economic, political, ecological, etc., where society and culture are seen dependent upon S&T. However, in systemic terms, the processes underlying science/technology and society interactions in the third and fourth sets are interdependent, circular or multilinear--although not necessarily efficient, progressive or just.

The fifth set refers to the relationship between science/technology and education, both formal and informal. Education is a product of culture. It is also its carrier and promoter. No society has ever transformed itself without the aid of education. Artifacts--science, technology, arts, warfare--and values--humanity, sensitivity, propriety--are the products of learning. If we want people to be humane, we must teach them humanity. If we want them to be scientific, we must teach them science and its values. A mismatch between social goals and education would lead society nowhere. I suppose it boils down to defining the social goals, choosing the best available alternatives for achieving them, developing and promoting the chosen alternatives by all possible means, including education, scientific education in particular.

And finally, we are confronted with the problem of preserving and enhancing the common cultural heritage of mankind along with the very survival of humanity itself. The role of S&T towards achieving these goals in the Third World context is of central concern to us. First and foremost is the problem of developing indigenous capabilities, to be innovative and to apply new knowledge to meet basic human needs without insult or injury to local sentiments and life styles. There is no dignity in poverty. Lasting peace cannot be achieved without prosperity and dignity for all. S&T are among the finest products of human creativity and ingenuity. They must also contribute to human dignity and survival. If they do not, it is a cause of concern for all. We must then try to identify the forces which lead S&T in socially undesirable directions such as war, injustice and corruption and prevent their utilization for betterment of the human condition.

SCIENCE AND SOCIETY IN INDIA: CROSS PURPOSES

The above-mentioned areas or issues cover a broad canvas of what may be termed socio-cultural relations of S&T, with particular reference to the so-called Western science in non-Western culture areas. Their relevance to India is obvious, but our policy analysts and social scientists have paid scant attention to them. Most of our S&T policy analysis has been polemical or (economic) developmental. Cross-cultural studies on historical and social origins and interconnections of science, technology and society have been sadly lacking. Consequently, we have failed to develop a coherent philosophy of the nature and relevance of modern S&T for the Indian society of today and tomorrow in a global context. Modern S&T in India, therefore, remain culturally rootless, and often in conflict with indigenous needs and traditions. In more practical terms, their own development as well as large-scale application have been thwarted despite some very sound policies and meticulous planning.

Controversies and contradictions abound, as they should in a society with so many highly educated people, but some of them are simply outrageous. For instance, a hurriedly formed regional party was recently elected to power in one of the Southern states of India, invoking a "return to Ram Rajya" and went ahead quickly to appoint several high-powered advisory (to the government) commissions--on S&T, energy, environment--under the guidance of an eminent scientist. Sai Baba, a renowned godman and guru of a powerful section of the scientific community, has established a university to teach "science and technology" for the welfare of society. Many people say Gandhi was anti-West and anti-Western S&T. Others contend that he would have accepted whole-hog modernization of Indian society if he were alive today. I know staunch Gandhians who are using advanced methods of cultivation and cattle farming and do not hesitate to own cars, TV sets and refrigerators. There is a strong intellectual lobby which has made "appropriate technology" their business, indiscriminately--which means big is bad, small is beautiful, indigenous is sacrosanct and appropriate, and using Western technology, no matter how efficient, means alienation and national sellout. At the other extreme are scientists, administrators, businessmen and industrialists who consider West as best, indiscriminately, who constantly degrade indigenous traditions, including local research and development (R&D) efforts, and would like to follow the "Japanese model" all the way, which means free imports, commerce and multinational corporations.

There is a close connection between science and language, between Western science and Western languages. This has posed a serious dilemma to non-Western societies experimenting with Western science. Japan has found an ingenious way of Japanizing the Western metaphor by slight linguistic twists. China employs one of the world's largest translation services to convert Western literature into the Chinese idiom. In India, we have nothing of this sort going, except endless debate on the morality and usefulness of teaching and learning English.

Such contradictions are as much part of Indian economy, politics and bureaucracy as of society in general. Their result is endless compromises, *ad hocism,* hodge-podginess, and lack of single-minded devotion or direction to societal problems and problem-solving strategies. It is a truly mixed (or mixed up) situation, to let "hundred flowers bloom" haphazardly in a vast array of shapes and colours. It is also a mixed blessing: we have avoided totalitarianism and preserved a relative degree of freedom for private initiative and action, even at the cost of public good.

Many people praise or blame democracy for the mixed (up) state of affairs, for lack of strategic demarcations in the matters of public versus private, foreign versus indigenous, rural versus urban, science versus religion, tradition versus modernity, freedom versus accountability, etc. This would indeed be true to some extent in any society, let alone a democracy where freedoms are supposed to be greater. But we are not the only democracy in the world, or in Asia for that matter. We are not the only modernizing democracy with long-standing traditions and authoritarian sub-cultures either. Japan has the world's highest per man-hour productivity today. Japanese pride and reverence for kings, ancestors, and firms and families and their masters are supposed to explain this signal phenomenon. Sri Lanka, a small democracy with little indigenous techno-industrial capability and a per capita gross national product (GNP) of only $200 has one of the world's highest physical quality of life indexes (PQLI) (82 on a 0-100 scale next to India's 41).[2] Democracy or no democracy, some degree of national consensus on social goals and strategies seems imperative for progress.

A European scientist recently observed with appreciation that Indians displayed happiness and depth despite poverty and degradation next to the tensions and shallowness of the West despite power and affluence. That Indians, even the poorest, could intellectualize misery and philosophize existence was attributed by him to the depth of our psyches produced by an uninterrupted culture of five thousand years. Deep cultural and psychological roots--being happy, contented and philosophical under any circumstances--are indeed great virtues but they have their own drawbacks. Survival may be taken for granted five thousand years back and forth, this way or that way; misery may be rationalized fatalistically, time may become timeless; the past rather than the future may remain forever the guiding force; endless reflection may prevent quick action and implementation. Western S&T and many of their positive and negative impacts are products of the opposite cultural traits. India, along with the other Asian societies similarly characterized, will have to make necessary cultural and psychological adjustments if it chooses to critically absorb and rightly benefit from the Western experience.

These conflicts or contradictions are intimately connected with the state of S&T in society in a broader sense. They arise out of the uneasy but not uncommon interaction between forces of change and the status quo, modernity and tradition or, in the case of colonial societies, between Western and non-Western sub-cultures. These concepts are imprecise and do not convey much. They equate Westernization, modernity and change with

progress; non-Western values and traditions with status quo, and these together, with backwardness. They imply resistance to change as a given and this as the greatest stumbling block to social progress.

None of this seems to fit in the present context. The West has gone full circle many times over: from barbarism slowly to rapid social progress, to self-destruction through wars and excessive growth, the stagnation through self-doubt and lack of direction, to emerge a bit more confident and ready to start moving again. The rate of techno-economic growth has been fastest in the Southeast Asian region, where traditions, religion, even magic and superstitions abound. Unexpected wealth in the desert kingdoms has helped former nomads to transcend centuries in a short span of one decade in the economic sense despite continuing scientific and technological backwardness. A lot more than the proverbial conflict or consensus between tradition and modernity, between East and West, seems to be involved.

Many years ago Lewis Mumford and Jacques Ellul (and later Theodore Roszak and others) talked about the moral decay in Western civilization caused by extreme technologism. Daniel Bell offered the notion of the "post-industrial society" as an emerging answer to the dilemmas of the industrialized West. Then there were the revivalists of all sorts, evangelists and mystics posing as saviours and messiahs and offering spiritualism as an antidote to technologism. Now, Alvin Toffler has turned it all upside down by invoking a "third wave" of the future surging across continents through microelectronics. The "third wave" is supposed to be all-encompassing, a totally new form of social organization--business, industry, work, leisure, family, friendship--all shaped by the advanced technologies of the future. Toffler sees a great deal of turmoil in the Western world due to the clash between the new "third wave" and the dying "second wave," created by the industrial revolution. This turmoil will continue until the new wave fully replaces the old wave. We may infer from Toffler's work that the three waves are definitely progressive, where advancing technologies are the critical variables. Technological revolutions themselves are seen to take place smoothly. The trouble lies within their social milieus, with their social relations and consequences. The fact that technological revolutions are not, and perhaps cannot be, absorbed so readily and smoothly as they are produced, itself carries the main burden of proof of lack of all-round social progress. For real progress, technological change and its required socio-cultural accompaniments must come simultaneously, rapidly and completely.

Toffler's wave model has many implications for non-Western Third World societies going through the ordeal of development through "Westernization" besides the one of not necessarily having to go through the first and second "waves" in order to leapfrog into the third with the most advanced but appropriate technological mixes. The most striking thing in a transitional society like India is that there is a mixture of not just two, but three or four "waves", ages or eras simultaneously. These refer to certain stages of techno-industrial developments and related socio-cultural organizations and attitudes, not to the proverbial

cultural diversity of India. For the sake of convenience, only three stages are identified here:

1. Pre-industrial: Characterized by agricultural/rural modes of production and economy; primitive/traditional technologies; family-based occupations and communal or primary relations; past-oriented timelessness, ritualism and conservatism; cyclical nature of time/change.

2. Industrial: Characterized by machine-based industrial/urban modes of production and economy, formal organizations and professionalism, commercial relations, linear-futuristic perception of time/change, mass media; fast movement.

3. Post-industrial: (Combining Bell and Toffler's formulations [3,4]) characterized by high speed communication/information, production and service systems; emphasis on mass applications of very advanced technologies; shrinkage of time and space; multidimensional expansion of knowledge and consciousness; highly controlled decentralized systems; very high rate of change.

These characteristics are by no means new, unique or exhaustive. What is unique in India is the fact that they co-exist and clash with each other rather disproportionately at the societal, institutional and individual levels. Societally, I would venture to call 65-70 percent of India still in the pre-industrial age, 25-30 percent industrial, and 1-5 percent post-industrial. These attributions are impressionistic rather than statistical quantities. No single institution or individual can be considered entirely post-industrial, but there are many who are exclusively entrenched in the pre-industrial era. Even the most advanced systems, such as space, electronics and nuclear programs, have large traces left of the industrial and even pre-industrial modes and mentality in maintenance and management. The 25-30 percent of India that is industrial, has to constantly cope with a pre-industrial environment and lack of post-industrial systems and technologies that it should possess and/or have easy access to. Our managerial and technical systems are by and large the products of the industrial age that are often manned and managed by persons of pre-industrial mentality. The clash of eras is most visible in labour's attitude toward time, punctuality, precision, machines and organizational responsibility. Underdeveloped systems of production, maintenance, communication, transport, industrial information and distribution have come in the way of efficiency and growth of firms. Raw materials are procured from rural areas through primitive systems of handling and delivery. Rural labour's lack of education and adjustment to an urban-industrial environment have posed considerable problems in personnel management. Social unrest in the cities, such as religious riots, often cause factory shutdowns and absenteeism. These contradictions are some of the major factors contributing to low rates of productivity in India compared to international standards.

No Indian city is truly urbanized regardless of size and degree of industrialization. Various levels of technology and forms of social organization and attitudes, Eastern and Western

modes of living, rural and urban societies coexist and clash with each other in the cities. High-rise buildings have been constructed without proper maintenance and support systems such as water, telephones or elevators. Rural life ridden with poverty hides behind every fashionable shopping or residential complex. The most primitive to the most modern means of transport ply side by side, manoeuvred by people with little traffic sense or traffic rules to follow. Refrigerators, air-conditioners, even computers, are delivered by bullock carts. Gas cylinders burst regularly and kill people indiscriminately, because the companies are callous and consumers ignorant or indifferent to safety. Public transport, communications, water, power and sewage systems are either non-existent or only partially functional. Some of these anomalies can be attributed to uneven states of techno-industrial development, others to the related sub-cultures and attitudes which continue to reinforce the existing state of affairs.

It is intriguing to note how prevalent and deep-seated superstition, dogma and rituals are in the tenth largest industrial estate and the fourth largest S&T establishment in the world, with close to four million highly educated people, including two million qualified scientists and engineers. There is not a single Indian, I dare say, even among the most educated, who is truly modern and completely free from pre-industrial mentality. It is a part of being Indian to be superstitious, dogmatic and ritualistic. Or is it part of being human as well?

Outsiders have often observed with wonderment, Indians' apparent facility to live in several different worlds and eras simultaneously, to compromise so many contradictions within the individual personality. It is not uncommon to find prominent scientists who believe in supernatural phenomena, social reformers and preachers who are racists, modernizers and developers who oppose modern medicine and family planning, highly superstitious people who are excellent economic forecasters or strict brahmins who are leather technologists. How precisely these contradictions affect the totality of S&T, industry, modernization, change, etc., is not clear. But if India is to ever become a truly industrial or post-industrial society in its own right and in its own peculiar mold, she will have to produce a vision of the future which is consistent and coherent, where the basic premises will be less anomalous, where major philosophical, social and cultural contradictions will either disappear or be cleverly harmonized with the vision. Mass scientific education and a social policy aimed at removal of economic inequality and cultural deprivation will play a critical role in the emergence and realization of this vision.

Lack of clear vision about Indian futures has sometimes led our planners and policymakers in wrong directions. The resulting mismatch between S&T and human needs and culture has obfuscated general social progress despite the so-called scientific and technological progress. Modernization and development have often brought in their wake large-scale destruction of environments in the urban areas, hills, and forests. Displacement of unskilled labour, unemployment, rural to urban migration, and the rural-urban divide have all increased despite, and because of, certain technological, industrial and agricultural advancements. These are well known and amply documented facts which need no further

elaboration. We have approximately 25 million unemployed people today next to only four million at the end of the First Five Year Plan. In 1947, the total literacy in the country was 14 percent. During the first decade of development, it rose by 14 percentage points, to 28 percent of the total population in the 1961 census. In the next decade, the rate of increase was reduced by four percent, and the 1971 census counted 34 percent of the population as literate. A decade later, in 1981, the literacy count had risen by a mere two percent to 36 percent of the population. The relationship between levels of literacy and scientific and technological development may not be obvious, at first sight. But if science, technology and development are to be seen as part of the total process of change--as they should be--in which institutions and individuals play an equally important role--as they should, then it becomes obvious that no society can expect to transform itself without improving the levels and quality of thinking of its people as citizens, people who staff and manage institutions and people who generate new ideas and implement them.

NOTES

1. For further reference, see Aqueil Ahmad, "Science and Society in India and China: An Overview," *Society and Science*, Vol. 5, No. 1, January-March 1982.

2. PQLI combines infant mortality, life expectancy at age one, and literacy into a single composite index that represents a wide range of social conditions. Cf. Todd R. Greentree and Rosemarie Philips, *The PQLI and the DRR: New Tools for Measuring Development Progress*, Communiqué, Overseas Development Council, Washington, D.C.

3. Daniel Bell: *Coming of Post-Industrial Society: A Venture in Social Forecasting*, (London, Heinemann, 1974).

4. Alvin Toffler: *Third Wave*, (London, William Collins, 1980).