

Science, scientists and society*

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It is a privilege for me to deliver the Frontier Lecture at a premiere science institution of our country, an institution which embodies the vision of Jamshedji Tata who could foresee the role of science in the development of our country as early as the late 19th century. That he could envisage the role of iron and steel and electricity during his visit to Europe and America is understandable, but for a businessman to foresee the need for an institution like the Indian Institute of Science which could produce scientific talent in various fields that would enable India to keep abreast with the industrialized West, is to say the least, unusual. Instead of bestowing his wealth in traditional charity, like building temples and hospitals, he designed major assets for the country which could also provide large-scale gainful employment. Unlike the present, wealth to him was a means to a goal and not a goal in itself.

It is interesting that it was his wish to include the social sciences and the humanities in this science-based institution, as also research into tropical diseases. Such breadth of vision in one born in the village of Navsari, demonstrates the vast talent that lies unexplored in our 700,000 villages.

The definition of 'frontier' is that of a territory between the known and unknown. This often implies that the known path is the right one in guiding the future. Yet the post-independence form of India's development requires redefining of our goal and questioning both the past and present means. Natural science implies a detailed and systematic study of a subject/process through observation and analysis for its meaningful use. However it is now generally limited to an intellectual observation/measurement of the physical phenomena of nature and should be aptly labelled as the physical or material sciences. It is the social sciences which deal beyond physical dimensions into the intellect, mind and soul of the unpre-

dictable *Homo sapiens*. The understanding of the seers of this subcontinent, who attempted to understand life through philosophical reasoning rather than mere physical measurements.

The aim of science is to satisfy human curiosity and to make life more meaningful and comfortable. To achieve this, the scientist must not only study nature, but also understand the relationship of man to nature, of which he is but a part. This is essential if the knowledge gained is to be utilized in a meaningful manner and not become the harbinger of a 'thoughtless technology' which man uses for manipulation of nature and his fellow beings.

Evolution is an endless process. The vast changes that man has wrought are on an entirely different time scale to the normal process of evolution and can only be compared with the occasional cataclysmic changes that have occurred over the millennia. It is the homocentric, eurocentric and now the universocentric view that makes *Homo sapiens* believe that we can conquer all that we behold. And yet every global villager/tribal has a more holistic understanding of his place and role among nature's creations to which he bows and even worships. A letter of a Red Indian Chief in 1855 says: 'How can you buy or sell the sky, the warmth of the land? The idea is strange to us. We know that the white man does not understand our ways . . . The earth is not his mother, but his enemy and when he has conquered it, he moves on. And to harm the earth is to heap contempt on the creator'.

Joseph Needham after his life-long study of science and civilization of China wrote: 'Francis Bacon selected three inventions – paper and printing, gunpowder and the magnetic compass which had done more to transform the modern world . . . He died without ever knowing that all of them were Chinese. The sciences of China and Islam never dreamed of divorcing science from ethics; but when at the scientific revolution ethics was chased out of science, things became different and menacing. Science needs to be lived alongside religion, philosophy, history and aesthetic experience; "alone it can lead to great harm".'

The reason why this relatively new science from Europe with all its advantages now poses a threat to the very survival of man and his environment lies in its very source – the original sin. Persecuted by Papal dogma, Galileo and Copernicus and their inheritors divorced science from religion, the consequences of which we are experiencing today.

The inequity and dichotomy in the field of health belie the path we have pursued to date. Health and human happiness, more functions of the mind rather than merely of the body, cannot be achieved under conditions of poverty and destitution. Bangladesh, while lagging in Cartesian economic indices, ranks first in a study on the Index of Human Happiness.

Whilst human greed has prevented the eradication of poverty, Western science has prevented the use of the older holistic sciences like Ayurveda and yoga for human benefit, while supporting the market-driven promotion of inappropriate, but costly technologies.

Devoid of the profit motive, Western science also has potential to help eradicate poverty without abuse of environment or polarization of societies, whilst preserving our age-old culture, values and cost-effective traditional practices. This is revealed even in the over-mystified field of health wherein a people-oriented form of governance, effective and accessible health and medical care can be provided to almost 95% of our people within the 100,000 population level (ICSSR/ICMR Report, 1981) within a third of our country's present expenditure. Kerala, like China, expending US \$ 15 per capita per annum on health has achieved an IMR of 13 compared to 9 of the US, spending over \$ 5000 per capita. As a result of female literacy, Kerala has also achieved a birth rate equal to that of Germany. The Peoples' Ninth Five Year Plan of Kerala, undertaken in its 990 Panchayats by the people themselves, has been supported by scientists and the peoples' science movement of the Kerala Sahitya Shastra Parishad. A remarkable transformation has been wrought by utilizing only 55% of 39% of the state's planned budget allotted for the purpose. The significant improvements achieved

*Text of the lecture delivered on 7 November 2000 at the Indian Institute of Science, Bangalore, as a part of the Frontier Lecture Series, Jointly sponsored by the Indian Institute of Science and the Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore.

in the first two decades after independence, viz. reducing malaria incidence from 100 million cases per year to seventy-five thousand and eliminating small pox were due to a liberated and enthused people led with vision and integrity at a time when India's economy was at its lowest. Such experiences indicate that it is not the amount expended that determines health and welfare, but how it is incurred and for whose benefit.

Such gains in our health status are now regressing despite vast increase in financial and infrastructural inputs. Consequently the 10% urban Western-oriented, affluent elite live in stark contrast to the 700,000 villages and urban slums whose very survival is now being threatened. The solution lies in placing the common people, who are neither awed, corrupted or culturally enslaved in control of their own destiny. Faith in our people as well as their innovation and capacity for solving their own problems has been eroded due to unlimited loans provided by foreign institutions like World Bank and the inevitable imposition of the Structural Adjustment Policy by the IMF. A Western imitative form of development has resulted under the garb of science, which has little relevance to the problems of our country and the needs of the vast majority of its people.

The 73rd and 74th Constitutional amendments ushering Panchayati Raj now provide the opportunity for a radical change and ushering a new frontier. The demand in the ongoing third national struggle for independence is not for a distant representative form of democracy that has failed, but a face-to-face participatory type based within villages or urban 'mohallas', where people with their inherent ability and self-interest now seek to be in charge of their own affairs. Scientists need to support this alternative, armed with our own intellect and values. This can also bring about an innovative resurgence of the material sciences and ensure the basic needs of all our citizens, while conserving our age-old values.

I urge the scientists to turn back from the unnatural sciences restricted to the laboratory and build upon the intimate relationship between man and nature as shown by Madhav Gadgil through his studies of the sacred groves. In fact, tools like the telescope and microscope should

further enhance our admiration for nature. Yet an 'entrepreneur' may convert this into thoughtless technology, giving us vegetables with pesticides, chickens with growth hormones, drugs worse than the disease and chemically polluted bodies of water.

Our scientists serve the needs of the West, but not our own people. The mass of scientists churned out by our universities is generally a poor replica of modern Western scientists who are unfortunately their role models. Our indigenous medicines derived mainly from natural sources are accepted only when promoted by the West as patented marketable commodities. Rather than replacing worn-out knees and prolonging life in intensive care units, the challenge lies in devising equitable people-based alternatives for health care using all available sources of knowledge and wisdom, such as gracefully accepting the normal process of ageing and the inevitability of death.

The educational system monopolized by our elite is conformist and imitative. Only minds unencumbered by this dual burden can solve a verity of our problems with modest resources but an abundance of ingenuity. Often, lack of resources provides a good stimulus by promoting attitudes of self-achievement, confidence and self-esteem. The efficiency of the 'dabbawalas' of Mumbai or the devising of super-rockets and computers at low cost are elegant solutions with high intellectual inputs. These appear easier to achieve when there is a barrier to the flow of imported knowledge and technology.

Let us build on the strengths of our age-old civilization based on the philosophical and spiritual concepts of life. It is these which have also nurtured our significant achievements ranging from mathematics and astronomy to medicine, architecture and sculpture. It is this integration of the material with the spiritual which is the unique contribution of this sub-continent.

The problem is how to release this vast force rendered latent through centuries of foreign domination. Appropriate universal education is an evident answer, but hard to achieve in the presence of an overcentralized political system with its bureaucracy and a profit-oriented private sector. Panchayat Raj now empowers the vast majority of our population in what is

predominantly the Peoples' Sector, to ensure relevant education and development in a non-violent manner through their vote. The obstruction by withholding information and providing misinformation to the people by vested interests can be overcome by the provision of widespread information to all citizens. Our apex institutions of science and technology can help to develop a national network of information and constitutional and legal rights of citizens under the 73rd and 74th Constitutional amendments, as also the 29 subjects covered under Schedule 11 which covers most of the information and consequently power bestowed to our people under the amendments. This fortifies the power of their vote and also the demand for appropriate education and health. Scientists can play a role not only by appropriate modification and use of new tools of information technology, but also start mobilizing the vast talent of our youth in rural areas, that will provide the base for future development of a truly Indian science. Those like Amulya Reddy and Eklaviya have commenced this role with Sarabhai and Chitnis establishing satellite communication units in rural areas. This will help devise new methods for science-based education, demonstrate capacity for self-help and promote an exchange between the scientists' knowledge and the People's wisdom which can usher in a new era in human social and economic development. All this can be achieved at a remarkably low cost, devoid of greed and the profit motive.

For scientists too, it will be a stimulating experience of re-establishing contact with nature, now lost in the restricted studies of 'natural science' in the laboratories. This will also result in harmonizing the roles of science, scientists and society with nature, of which we are a part.

To end with the words of Kant, 'Two things fill my mind with ever-increasing awe: the glorious heavens above me and the moral law within me'.

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