Review of:

**Dharampal. 2002. Esssays on the Tradition, Recovery and Freedom. Collected Writings Vol V. Mapusa, Goa: Other India Press.**

- D. P. Agrawal

Dharampal, the well known Gandhian and populariser of Indian history of science has republished his collected works through the Other India Press. So these valuable volumes have become easily available now. The total set of six volumes costs less than $30/-, a very cheap price for such valuable books. These are absolutely essential for all Indians and others interested in their history of science. The following is therefore not a review as such but more of gleanings from Dharampal's valuable works.

In this brief review we would like to bring out his ideas about "indigenous Indian technological talent and the need for its mobilisation", which is chapter 2 of his volume V. In chapter 1 of this volume, he discusses "some aspects of earlier Indian society polity and their relevance". In chapter 3 he deals with "the self-awakening of India: the context of the past, the present, and the future". Chapter 4 discusses "Indian polity, its characteristics and current problems". The last chapter is more philosophical as its deals with "*Bharaitiya chitta- manas* and *kala"*.

Dharampal quotes Sir Temple, governor of Bengal at that time, who was so contemptuous of the Indians. He said, "But we shall do more and more to direct their thoughts towards practical science, where they must inevitably feel their utter inferiority to us." Temple wrote this in 1875. In 1876 Mahendra Lal Sircar and his friends established the Indian Association for the Cultivation of Science at Calcutta. In 1885 J.C. Bose was appointed junior professor at Calcutta Presidency College, while in 1889 Prafulla Chandra Ray was appointed as assistant professor in chemistry.

Dharampal cites Pt. Malaviya in refuting the western claim that technological traditions began in the West. Pt. Malviya said, 'Such a statement denied the long history of Indian achievements in ship-building, smelting, weaving, etc.' According to him, 'the de-industrialisation of India and the history of the industrial revolution in the West were integral parts of one process, that colonialism preceded and helped create industrialism in Britain.'

Dharampal further points out, 'Whether the late 18$^{th}$ century elite was consciously aware of the then existing sciences and technologies of India or not, these were taken serious note of by European specialists during the 16$^{th}$, 17$^{th}$ and 18$^{th}$ centuries, as and when they were looking for knowledge, information, design, technique, etc., in any particular fields. Examples of such European research, attention, study and borrowing are innumerable. The collection of Indian botanical texts by the Portugese and the Dutch goes back to the early 16$^{th}$ century. The *hortus Malabaricus*, in 12 volumes, with illustrations of 750 species of Indian plants was published in Europe during 1678-93. It is said to contain certificates from four Kerala and Konkan Pandits about

the authenticity of the information in the 12 volumes. The design and function of Indian agricultural implements, especially the drill plough was as important to late 18th century British agriculture, as was the Indian practice of inoculation against smallpox and its rationale, or as the method and rationale of the artificial manufacture of ice in the Allahabad-Varanasi region had been a few decades earlier. Similar, or perhaps even greater attention was devoted to an understanding of Indian building materials and techniques, to various chemicals used in Indian industry and other processes and their sources, in Indian steel and its technology, in the prevailing Indian surgery, and even in the method of teaching in schools in India, especially in those in the south. The existence of petroleum wells and the use to which the oil was put to was first observed in Burma around 1797. The number of wells, in the area visited, was said to be 520, and their annual oil production about one lakh tons valued at over ten lakh Indian rupees. The oil was used for lighting lamps, for the painting of timber and the bottoms of ships and boats, and also used medicinally as a lotion in cutaneous eruptions, as an embrocation in bruises, and in rheumatic afflictions.'

About the Indian accomplishment in plastic surgery, Dharampal quotes no less an authority than J.C. Carpue FRS, the founder of modern British surgery. Carpue wrote in 1816,

> It was in this manner that the nasal operation had become forgotten or despised, in at least the west of Europe; when, at the close of the last century, it was once more heard of in England, from a quarter whence mankind will yet, perhaps, derive many lights, as well in science, as in learning and in arts. A periodical publication, for the year 1794, contains the following communication from a correspondent in India, which is accompanied by a portrait of the person mentioned, explanatory of the operation. 'Cowasjee, a Mahratta, of the castle of husbandman, was a bullock-driver with the English army, in the war of 1792, and was made a prisoner by Tippoo, who cut off his nose, and one of his hands. In this state, he joined the Bombay army near Seringapatam, and is now a pensioner of the Honourable East India Company. For above twelve months, he was wholly without a nose; when he had a new one put on, by a Mahratta surgeon, a Kumar, near Pune. This operation is not uncommon in India, and has been practised from time immemorial. Two of the medical gentlemen, Mr. Thomas Cruse and Mr. James Findlay, of Bombay, have been informed as follows: A thin plate of wax is fitted to the stump of the nose, so as to make a nose good appearance; it is then flattened, and laid on the forehead. A line is drawn round the wax, which is then of no further use; and the operator then dissects off as much skin as it covered, leaving undivided a small slip between the eyes. This slip preserves the circulation, till an union has taken place between the new and old parts. The cicatrix of the stump of the nose, is next pared off; and, immediately behind this raw part, an incision is made through the skin, which passes round both alae, and goes along the upper lip. The skin is now brought down from the forehead; and, being that a nose is formed with a double hold, above, and with its alae and septum below, fixed in the incision; so that a nose is formed with a double hold, above, and with its alae and septum below, fixed in the incision. A little Terra Joponica is softened with water, and,

> being spread on slips of cloth, five or six of these are placed over each other, to secure the joining. No other dressing than this cement is used for four days; it is then removed, and cloths, dipped in *ghee* (a kind of butter), are applied. The connecting slip of skin is divided about the twenty-fifth day; when a little more dissecting is necessary to improve the appearance of the new nose. For five or six days after the operation, the patient is made to lie on his back; and, on the tenth day, bits of soft cloth are put in to the nostrils, to keep them sufficiently open. This operation is always successful. The artificial nose is secure, and looks nearly as well as the natural one; nor is the scar on the forehead very observable, after a length of time.

Dharampal remind us, "As we now well know such an operation is described in detail in Susruta. Though perhaps less dramatically put, the narratives about the Indian method of inoculation, on the manufacture of ice, on Indian agricultural implements, regarding the technical details and economics of the manufacture of Indian steel, on Indian chemicals and dyes more or less follow a similar strain. The narratives seem to have been responses to urgent and contemporary British need; and it may be assummed that India was one amongst several places where such enquires were conducted, published for specialist and scholars seem to suggest that what was relevant in them to contemporary British or European requirement was incorporated in the corresponding practice of the borrower, in time internalised and thereafter perhaps within a period of fifty years, the origin of the incorporated, at least in practice, quite forgotten".

The Europeans appropriated such Indian knowledge and took off there. 'By stages, Europe seems to have been able to integrate or graft what it felt important on to its own technological frame, and its stock of knowledge. By about 1820, or 1830 Europe had far surpassed in matters which interested it, all those who had contributed to its scientific and technological growth; and had, therefore, no need to remember details of the sources from which the borrowings had been made'.

Analysing the cause of the decline of the Indian industry, Dharampal says, 'However the erosion and decline of Indian industry and technology in the late 18$^{th}$ and first half of the 19$^{th}$ centuries had, as is well recognised today, little to do with factors relating to Indian technological practices and their economic efficiency. In these respects, many of them could have withstood efficiency. In these respects, many of them could have withstood foreign competition (as Indian cotton textiles did for many decades till about 1850). The decline and destruction was politically and fiscally induced by deliberate British policy. The way this decline happened in the Indian textile industry is well mapped out amongst others by Dr Jitendra Gopal Borpujari in his recent study (the British Impact on the Indian Textile cotton Industry 1757-1865)'.

Lamenting the short-sighed policies of the Indian Govt of copying the west in industrialisation, Dharampal suggest that 'One of the explanations for such a possible preference may arise from the fact that most of what we have produced in the past 30-40 years is not any new basic technology, but largely adaptations of what prevails

elsewhere. Even much more, we seem to be taken up merely with the production of parts for the technology and machines received by us from the modern industrial countries. Such a course is bound to effectively exclude us from any improvisations of our own, even when these occurred to us'.

Dharampal pleads that one essential task is to bring the innovative and technological skills of our people, those who professed tham for millennia and till at least 1800, back to rebuilding of our primary economy and our industry.In retrospect, at least, the observation of the representative of the Visvakarma Community before the industrial Commission 1916-18, that keeping the technically competent artisan classes out of the new scientific and technological education has done great harm, seems to have come true.

He remarks that the seeming simplicity of Indian technology or theory was a result of high degree of sophistication and exact measurements. The design of the Indian steel furnace (which was in extensive use till about the early 19$^{th}$ century), is a fair representation of this sophistication.

Dharampal forcefully suggest that 'we should do whatever we can in the way of resource allocation, supporting structures and laws, subsidies at necessary points, and markets support, to bring back to life the old Indian method of smelting iron are and the manufacture of iron and steel. Such an attempt, however, need not interfere with the great steel plants. Around 1800, a movable furnace of that time could on an average produce about 20 tonnes of fine-grade steel, if worked for some 35-40 weeks in the year. I had roughly estimated on the basis of available data for various areas that the number of such furnaces around 1800 might have been approximately 10,000. it is quite possible that the number was far larger but that most of them only worked for 10-20 weeks in the year. It is probable that in today's circumstances, these furnaces may be found highly wasteful of both ore and fuel; and to start with, the steel that they will produce may be of relatively poor quality. To some an attempt of this kind may seem a great waste. But to the same people, a loss of a few hundred crores here and there because of hasty decisions, or defective technology, etc., may look like the ordinary hazards of modern economy and industry; while a loss of 10 to 20 or 50 crores on a project of this seems unpardonable'.

In this connection, I (D. P. Agrawal) am reminded of the study we have done on traditional iron and copper technology in Uttaranchal, which was dismantled by the orders of the British. Uttaranchal provides very suitable sites for restarting old smelting furnance near the mineral resources which are so abundant in this region.

Dharampal also pleads that 'by restoring the old smelting furnaces (say in about a hundred selected localities where good raw material is readily available and where there is still some memory of the old method in those who used to be engaged in it decades ago or had observed it working when young), we quite possibly will help the old technical and innovative skills to come alive. Any superior guidance, etc., by modern experts, or administrative busybodies-till it was actually sought as man to

man-will have to be strictly avoided in such an attempt. It is possible that success may not be achieved in every instance, but only in a half or quarter of them. Even such partial success, however, would provide us a starting field metallurgist straight in the face and the two can then have a useful technical interchange. The old smelting furnace ultimately may have to be discarded in its old form, or modified in many ways in today's circumstances. But its re-creation in hundreds of localities and the taking of it through the production process would have taught a variety of lessons not only to our high-science and high-tech men but also to those who had for generations been engaged in this particular technology. It should also restore the confidence of the smelters, as also their sense of dignity; but even more make them examine the process anew in today's situation. That smelting furnaces like these were tried in China in the 1950s is well known. Why they were initiated, what happened to them afterwards, and what lessons were drawn from their reworking is not known however, even if our attempt turns out to be on similar lines as that of China, it need cause no mental disturbance. Every civilisation has to do its own learning and in its own way. The knowledge of what others did can only serve as one pointer amongst many'.

Forcefully advocating the revival of our own traditional technologies, Dharampal pleads, 'Similar understanding can be initiated in many other long neglected technologies and industries. It should not be surprising if at least some of them (with minor modifications here and there) prove to be as productive and cost-efficient as the new technologies which we have borrowed from modern world industry'.

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