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PATTERNS OF COLONIAL SCIENCE IN INDIA*

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The present paper seeks to explore the paradigms of scientific development in a colonial situation. The history of British India during the last century spectacularly illustrates a close link between science and imperialism and my endeavour will be to underline the nature, course and significance of this "link" with the help of a little theoretical discussion to be substantiated by a few illustrative examples from certain scientific works particularly that of the Geological Survey of India.

Objections may be raised to the use of the term "colonial science". But it has to be understood that science is, and infact has always been, not an esoteric but a social activity.[1] The ideas of science are not the simple products of the logic of experimental methods[2], rather they stem from the socio-economic background of previous times. For instance, whatever may be the biological significance of Drawinism, it nevertheless reflected laissez-faire in its full cry. The developments of eighteenth century integrated science firmly into productive mechanisms.[3] The intellectual atmosphere of the nineteenth century, dominated as it was by the rising class of manufacturers, favoured the adventure of science,[4] and this in turn gave birth to a phenomenon which for want of a better term may be called "the phase of colonial science." Perhaps no other word can describe so aptly the travails of science groaning under a colonial framework. Colonial science is a dependent science wherein the result-oriented research in applied science heavily supersedes the curiosity-oriented research in pure science.

In 1894 Engels noted "if technique largely depends on the state of science, science depends far more still on the state and the requirements of technique." The nineteenth century British India bears full testimony to this observations.[5] With the establishment of imperial hegemony, popular local knowledge and skills suffered an eclipse and in its place came what Anis Alam calls "production science,"[6] that is a science for profit, science for the accumulation of capital aiming at the full exploitation of raw materials and maximum profit at minimum cost.

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George Basalla calls it, may be euphemistically, the spread of western science to the non-western world and tries to explain the phenomena with the help of a triangular model. During phase 1 the non-scientific society provides a source for European science; phase 2 is marked by a period of colonial science; and phase 3 completes the process of transplantation with a struggle to achieve an independent scientific tradition or culture.[7] Science during the initial phase is an extension of geographical explorations plus the appraisal of natural resources. But one may justifiably grudge Basalla's description of the colony as a non-scientific society.

Does this apply to India? In fact every society cherishes some scientific traditions, however crude it might be in form and application. Sixteenth century India, for instance, had a scientist of remarkable versatility in Fathullah Shirazi who made the first multi-barrelled cannon and also worked out the Ilahi era.[8] Jehangir took keen interest in the fields of animals and plants and also in chemical technology, medicine and astronomy.[9] Even Charles Grant, a Director of the East India Company, (during 1790's) acknowledged, "Not that the Hindoos are wholly destitute of simple mechanical contrivances. Some manufacturers are carried to a considerable degree of perfection", [10]. One Mohsin Hossain of Arcot through his Theodolite impressed George Everest, the Surveyor General of India (1830-43), as a remarkable mechanic of inventive talent.[11] Of Radhanath Sikdar who is said to have discovered the highest mountain peak in the world, Everest observed, "in his mathematical attainments there are few in India—European or native—that can at all compete with him.....even in Europe these attainments would rank very high."[12]

In view of the above mentioned examples one can hardly accept Basalla's thesis of the existence of a non-scientific society before the advent of colonial science. His model is thus imperfect and at best, as he has himself admitted, a preliminary or heuristic device.[13] The model can be corrected by substituting "non-scientific society" with "pre-colonial science".

Colonial science undoubtedly represents an advance over the pre-colonial science. How did it emerge? Because, a western historian of science explains, "in addition to greed for riches and domination, the white man became possessed suddenly of a strange spirit of adventure, of an insatiable intellectual curiosity."[14] But is the phenomena so simple as to be explained by 'curiosity' and, 'the strange spirit of adventure' which the author has referred to? Certainly not. Basalla warns against the use of 'colonial science' as a pejorative term implying the existence of some sort of scientific imperialism whereby science in the non-European nation is suppressed or maintained in a servile state by the imperial power.[15]

One can, however, doubt this explanation in the context of British India's experiences. To quote but one example, speaking before the Indian section of the Royal Society of Arts in April 1911, Sir T. H. Holland, former Director,

Geological Survey of India (1903-1909), confessed, "India at one time manufactured its own metals and inorganic chemicals; but with the opening of the Suez Canal and with concurrent improvements in marine engineering, freight charges from Europe became so reduced that the European manufacturing chemist could 'dump' his bye-products at Indian ports, and from there our growing network of railways has enabled the importer, either to kill the native industries altogether, or to drive them back to remote parts of the country."[16]

The establishment of the Royal Botanic Garden, the vigorous survey works, and various geological explorations provide good illustrations of how a colonial power utilises the various branches of natural science for spreading its economic tentacles. For instance, the plan of a botanic garden owes its origin to the need of growing Burma teak on the banks of Hooghly for ship building purposes. One Robert Kyd, the then Secretary to the Military Deptt. of Inspection, took up the challenge, got full support from the Company, and thus started the large scale cultivation of commercially beneficial plants like teak, cinnamon etc.[17] Next, the political ambitions of the East India Company necessitated a thorough geographical knowledge of the sub-continent; hence the Survey of India.

By far the best illustration of the use of science for colonial purposes can be found in the working of the Geological Survey of India. The economic value of the geological investigations proved of immediate concern to the East India Company with the coalfields of eastern India looming large.[18] In the first quarter of the nineteenth century noted mineralogists and surveyors like Laidlow, Voysey, Dangerfield, and Herbert were exploring Kumaon, Malwa and Himalaya regions. But these works were little more than "sproradic reconnaissances with natural history." A definite shape, however, emerges when the Company appointed "A Committee for the Investigation of the Coal and Mineral Resources of India" in 1836. This Committee stands as a milestone in the evolution of colonial science in India because here for the first time various types of minerals and coal were listed alongwith the map illustration of the sites as well. In 1846 D. H. Williams was appointed as Geological Surveyor to the East India Company. He prepared two reports, one on Damoodah Valley and the other on Ramghur coal fields. In his second report Williams discusses, interestingly enough, the unfortunate results of the Permanent Settlement on mineral deposits.[19] It was, however, Thomas Oldham under whose direction G. S. I. emerged as a premier scientific institution in India. The Memoirs, Annual Reports, and Records of the organisation bear witness to this[20]. No wonder, the Indian Industrial Commission of 1916 spoke highly of the Survey.[21]

But it is quite doubtful whether these surveys could at all help western science take roots on Indian soil. Perhaps not. Several reasons can be given. Firstly, the Company always insisted on the secrecy of maps and surveys and restricted the art of surveying to their own convenanted or military servants. Phillimore quotes a Surveyor General lamenting, "The Government had notified me that they

wish to throw cold water on all natives being taught, or employed in making geographical discoveries."[22]

Secondly, Indians were seldom allowed to climb up in the scientific hierarchy. Radhanath Sikdar remained where he was even after his election (in 1864) as a Corresponding Member of the Society of Natural History (Bavaria)—a rare distinction conferred by a reputed German Philosophical Society on a foreigner.[23] In the G.S.I. the first Indian apprentice was appointed in 1873[24] and a graded post was given in as late as 1880 to P. N. Bose who had later on to leave the Survey under unhappy circumstances.[25] Thus the Indians were excluded, as a matter of policy, from any effective participation in the government scientific undertakings, and the exciting work of a century by many able minds was largely lost on the people.[26] No wonder, while making a centenary review of the works of the Asiatic Society from 1784 to 1883, the reviewer could mention only two papers by two Indian authors out of 347 papers on mathematical and physical sciences, and even on geological works which were the most systematic under the then existing situation, the author found only two Indian contributing three papers out of 296 papers.[27]

Another reason why western science could not take firm roots in India, and as such an important characteristic of colonial science, is the utter neglect of technical education. Even the much-publicised Wood's Despatch of 1854 did not pay required attention to the field of scientific education, and research. A few industrial schools were opened, but as a Commission later acknowledged, such school was, at best, "a defective instrument of education owing to the non-commercial conditions under which it must necessarily be carried on."[28]

The non-teaching character of the universities established in 1857 was another handicap. At the Presidency College the Government made provisions for professorships in natural philosophy and geology, but the non-governmental colleges where the majority of students received instructions, had no means to appoint qualified science teachers and establish laboratories, and therefore, to offer science courses.[29] What to say of giving incentives, the Syndicate of the Calcutta University rather resolved in August 1858 to oppose the introduction of a subject like geology into the academic curricula.[30] In July, 1859 Oldham submitted a memorandum to the Government. "On the most effective and at the same time most economical means of teaching Geology and its colateral sciences in Calcutta."[31] But of no avail. There are evidences to suggest that students of European and Anglo-Indian origin were preferred for science education. In 1864, for instance, an official proposal came to make available works on Science and Literature for European students.[32]

An exceptionally excessive governmental control over scientific undertakings often hampered a logical development of western science in India. The Government would always keep on goading the various organisations to work along only

economically beneficial lines. Oldham once almost regretfully recorded, "The pressing demand for a knowledge of the true state of the coal fields of Damoodah and Adji led to the diversion, under the special sanction of the Government of India, of two of the geologists to that part of the country, after they had actually commenced their field work elsewhere....."[33]

A good example of how scientific inventions were pressed into imperial service can be found in the working and extension of telegraphic services during the 1850s and 1860s. The Morse Code discovered in America found its way to India in less than a decade and W. B. O'Shaughnessy, the first Superintendent of Electric Telegraph in India, promptly affected little modifications in the Morse Instrument to suit Indian conditions.[34] The military significance of the telegraph, particularly in the wake of the Revolt of 1857, is evident from the following letter from the Deputy Superintendent of Electric Telegraph in Bengal to the Secretary, Government of India (dated Aug. 3, 1859).

"I have the honour to submit for the decision of the Government of India the question whether the Electric Telegraph Office at Sasseram should be any longer maintained. This office was opened under the orders of Government at a time when the neighbouring district was greatly disturbed and Sasseram was made a military post. Lately the force has been removed to Dehree, and since that removal Sasseram would scarcely appear to be a place of sufficient importance to require a telegraph office."[35]

Not only this, telegraph was sought to be used also for fanning out British influence in the flanking as well as far-flung areas. In 1859 William O'Shaughnessy made an ambitious plan for the construction of telegraphic line from Constantinople to Basra[36] and also proposed a telegraphic link between Burma and Australia.[37]

Another significant feature of the colonial science phase in India is the relative neglect of medical and zoological sciences and this comes in sharp contrast to larger investment in botanical, geological, and geographical surveys from which the British hoped to get direct and substantial economic and military advantages, while medical or zoological sciences did not hold such promises. Hence, even though a medical college had been established in 1835 the expected emphasis on research could come quite late in the Plague Commission Report of 1904. Here for the first time was underlined the need of a Medical Research Department under the Central Government and the establishment of the Indian Research Fund Association for promoting research in medical problems.[38] This delay is understandable. The western system of medicine had after all been introduced specifically for the British Army, the civil servants, and the European traders.[39] This is evident from a despatch from the Secretary of State for India (dated Dec. 31, 1858) wherein, while sanctioning the establishment of a school of medicine and surgery at Lahore, he remarked, "the proposed Medical School should provide for the efficient training of 'Safedposh' surgeons."[40]

Zoology ranked quite low in the priority list of the Government, may be because of the possibility of almost nil material gain as return. Some early naturalists did not conceal their disinterest in zoological studies. William Jones, for example, gave a very strange explanation; he would not patronise such studies because it involved pain to the living objects; "why deprive butterfly its natural enjoyment because it has the misfortune to be rare or beautiful," he observed.[41] Blyth, Sykes and Hodgson, however, tried to win some recognition for the subject. Still while writing for the Journal of the Royal Asiatic Society in 1836, Hodgson had reasons to lament that Indian zoology was carried on either by men who knew the animals but were "inexpert in science," or by those "rapid passengers" who had no time to observe creatures, but worked up their accounts afterwards.[42]

An important feature of colonial science is almost total absence of pure or theoretical research. Research activities in sciences like Physics and Chemistry which had by then reached a "professional stage" in Europe, were hardly noticeable in India.[43] India was found suitable only for field research and Indians for subordinate field works. India was in fact used as a "vast storehouse" with exotic varieties of flora, fauna and minerals who were to flood the European laboratories for many years to come. The real research was thus to be done in the 'metropolis'. And India could get only ancillary units. As Russel wrote in 1908, "general fundamental problems are best worked out here (England) or in Europe or America where the number of workers is greater and where it is easy to get into touch with those able to render useful assistance."[44]

The Indian Advisory Committee which was formed in 1898 by the Royal Society to advise the Government on the problems of science in India, also consistently held that the scientists in India should leave pure science to British and apply themselves to the applications of science.[45] In view of this 'colonial' division, the works of European scientists in India, however fundamental and important, finally emerge as an extension of the over-all European scientific effort, about which, as S. N. Sen puts it, there was hardly anything Indian except that the objects of research, the living as well as the non-living, belonged inseparably to the geographical world of India.[46]

This 'apartheid' in science made the Indians react strongly during the last quarter of the last century. Basalla's phase 3 comes into operation, that of the local people trying to become self-reliant in scientific matters. Colonial science passes its peak when there begins a deliberate campaign to strengthen institutions at home and end reliance upon the external scientific culture.[47] This found expression in the establishment of the Indian Association for the Cultivation of Science in Calcutta in 1876.[48]. Mahendra Lal Sircar, J. C. Bose, P. C. Roy and C. V. Raman were the first rays of the new dawn. It was not a strange coincidence that people found another association being formed the very same year, i.e. the Indian Association to fight politically the repressive policies of the Government.

It was during this phase of transition that some of the most intractable dilemmas confronting Victorian scientific administration were brought into focus.[49] How to reconcile the requirements of a paternalistic Raj and the rising aspirations of its subjects? The British tried to affect a balance through the creation of two agencies—the Indian Advisory Committee of the Royal Society, and the Board of Scientific Advice of the Government of India. Macleod finds the history of these bodies, at least in part, "a study in failure—failure in vision, in organisation and in objectives.[50] Though they failed to act as an efficient midwife ensuring smooth transition, they nevertheless rang the deathknell of the colonial phase in Indian Science.

Some regenerative aspect of the British activities can not, however, be overlooked; for example the publication of scientific journals and formation of scientific bodies and museums. One author finds utilitarian spirit in "that zealous band of surgeons and engineers, sweating in the torrid plains or struggling through malaria-ridden forests, who gave the world its basic knowledge of India's natural history."[51] Larwood agrees that much that was written during the period was of little permanent value and that it was largely confined to the observational science, but finds quite remarkable the enthusiasm with which scientific interest were pursued and the bulk of the work produced.[52]

An analogy is often drawn with Japan which "was as dependent upon the western scientific culture as any of those countries that are conventionally classified as political colonies of the western nations."[53] But Japan could easily assimilate western science, thanks to her independent existence and a liberal set-up particularly after the Meiji Restoration. In India, on the other hand, the requirements of colonial government in all its ramifications made science dependent and greatly limited in its scope.[54] The seed of science does not grow unless the social ground is well prepared for it by economic activity.[55] Can such preparation be done under a colonial framework?

One may argue that the scientific developments in British India should be treated as individualistic romances with natural history without linking it with the political economy of the time. But where would natural science be without industry and commerce[56] For instance, the geological operations were not conducted solely as a branch of scientific research, instead what India got was the phenomena of Economic Geology. Oldham himself recognised that the original reason for his appointment was the study of the coal and other mineral resources of India.[57] Britain, being the ruling power, controlled the modes of production, and science in view of its catalytic nature,[58] could not be allowed to tamper unfavourably with such modes; hence the phenomena of colonial science.

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