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Science Institutions in Colonial India: Some Snippets, Some Lessons

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Abstract

Scientific institutions are modern icons and these came to India as part of the colonial baggage and soon became the carriers of new ideas and in fact claimed to symbolize modernity itself. But this modernity came in a quite subverted form, was refigured further by the recipients, and this came to be known as colonial modernity. Did the process of institutionalization differ in colonial and non-colonial settings? What debates did institutionalization spark? What did it mean to the colonizer and the colonized? The following brief survey tries to address these questions in a modest way.

Key words: Agriculture, Colony, Education, Exploration, Institutions, Knowledge, Medical, Research, Technical.

1. Introduction

The discursive terrain of history of science is replete with numerous debates on its nature and evolution, its changing contours, its role and place in the complex civilizational journey, and finally, the enormous impact it has on our own life and time. Near past hangs on our shoulders probably more heavily than the distant past. Even at the risk of being labelled a Eurocentric, I would prefer to argue that the Renaissance-induced changes and 'revolutions' define our contemporary existence as nothing else does. However critical some scholars may be of Eurocentric explanations, they depend heavily on European-language sources and even their conceptual frameworks are very often of European origin, which, in turn, are super-imposed on non-European contexts. It is no mere coincidence that during the era of scientific revolution, different trading companies were established to undertake colonial expansion. Flag followed the trade and both recognized the relevance of techno-scientific knowledge.

Colonization was without doubt one such compelling force which brought in its wake certain ideas, institutions and processes which were so unforeseen and different (if not incongruent) from what we had. Some call it civilizational encounter, others subjugation, for some it is 'the braiding of East and West around material objects and ideas' (Mukharji, 2016, pp.2-34). Some call European colonization a 'natural experiment' which revolutionized institutional development (Hoff, 2003). To my mind this is an extreme view. But it is true that the societies with extreme inequalities (like India) had pretty slow institutional changes. For example, pre-colonial India had fairly strong scientific traditions in the realm of astronomy, medicine and mathematics. There were institutions too (like *tols, agraharas, mādrāsās*, and *maktabs*) that housed and propagated certain scientific ideas. But these were of limited nature and resources. Sawai Jai Singh (1688-1743) had brought several astronomers from different parts of the country and had virtually established some sort of a royal society of astronomy in Jaipur. This was an

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exception which despite its potentialities had, unfortunately, failed to notice the Copernican revolution. Establishment of the British rule in the second half of the eighteenth century in the garb of a trading company was a game-changer. Scientific institutions are modern icons and these came to India as part of the colonial baggage and soon became the carriers of new ideas and in fact claimed to symbolize modernity itself. But this modernity came in a quite subverted form, was refigured further by the recipients, and this came to be known as colonial modernity. Did the process of institutionalization differ in colonial and non-colonial settings? What debates did institutionalization spark? What did it mean to the colonizer and the colonized? Institutions were needed to house the different kinds of knowledge on the local people, topography, resources, etc. that were coming from the numerous agents of trade and the state. They were also needed to enlist the support of the local elite and gradually create a subordinate cadre which would help consolidate the colonial state. These institutions were not mere replicas of the metropolitan institutions. It all began with the establishment of the Asiatic Society in 1784 in Calcutta.

2. The Asiatic Society: A Beacon

This was a unique experiment, the first such in Asia. The scope and objects of it enquiries were: 'Man and Nature; whatever is performed by the one, or produced by the other' (Fermor, 1935). What could be colonial in such a magnificent objective! The difference lay in practice. Though the criteria for its membership was nothing more than 'a love of knowledge and zeal for promotion of it', Indians were not taken as members until 1829, and no Indian made any scientific contribution to its journal till the 1880s. The Asiatic Society suffered and prospered simultaneously but remained a beacon of knowledge for long. It was the sole organ of research in Asia. Whatever was done in geology, meteorology, zoology and botany was done through the Society. Gradually all these branches developed on lines of their own and blossomed into separate departments. The society multiplied by fission, and gave birth at successive epochs to the Geological Survey, the Indian Museum, the Meteorological Department, the Botanic Survey, and the Linguistic Survey (Risley, 1904). As *Nature* noted in 1907:

> Like all the scientific organizations in the East, it has suffered vicissitudes. The short and broken residences of Europeans in the country, pressure of official work, lack of native co-workers, want of libraries of reference, and last, not least, the indifference of the Indian Government, which prefers that its servants should devote their spare time to the judgments of the High Courts or the circulars of the Board of Revenue rather than to the science and literature of the country, have at times interrupted its progress (*Nature*, 1907).

Another important scientific society was the Calcutta Medical and Physical Society, established in March 1823. The objectives of this Society were twofold—first to collect original papers relating to discoveries in medicine and surgery, and in the branches connected with them, as researches in anatomy, physiology, botany, chemistry for the advancement of professional knowledge, for the mutual benefit of the members, more particularly with reference to Indian diseases, and treatment—the papers would be presented, read and discussed at regular appointed meetings and afterwards published, and entitled 'Transactions of the Society'. And the second objective was the formation of a select and extensive medical library for the use of its members. It broke the social and professional isolation of the doctors, and without any government aid, was able to publish its *Monthly Circular and Selections* regularly. The Medical and Physical Society of Calcutta elected four Indians – Radhakant Deb, Ramcomul Sen Madhusudan Gupta and Raja Kalikrishna Bahadur, as corresponding members in 1827 and they did produce few papers on indigenous drugs

(*Transactions of the Medical and Physical Society of Calcutta*, 1827-31).

These societies rendered invaluable services, particularly through their journals whose standard compared very favorably with that of European ones. It was no mean achievement that Calcutta, with a reading public of a little more than two thousand, could produce and support scientific journals like the *Gleanings in Science* and *Calcutta Journal of Natural History*. The latter even attempted to establish in 1841 an Indian Association for the Advancement of Natural Science (*Calcutta Journal of Natural History*, 1841) on the pattern of the British Association for the Advancement of Science. These voluntary societies were important institutions in their own right.

3. An Age of Explorations and the Birth of Institutions

The East India Company period was basically an age of explorations. The era of exploration had its own romance. Later institutions were established and gradually professionalization came. The Company appreciated the significance of botanical and geographical investigations and encouraged its interested employees to undertake such activities (Sangwan, 1991; Kumar, 1991; Damodaran, et.al., 2015). Numerous explorers like Rennell, Kyd, Roxburgh, Buchanan, Carey, Lambton, Wallich, O'Shaughnessy and others emerge as pioneers. These colonial scientists tried their hand in several fields simultaneously and were in fact botanists, geologists, zoologists, physicists, chemists, geographers and educators - all rolled into one (Kumar, 1995). This had its positive as well as negative points. As data-gatherers they had no peers; but for analysis and recognition, they had to depend on the metropolitan scientific culture whose offshoots they were and from which they drew sustenance. In the initial stages a colonial scientist was, to a large extent, the master of his agenda; and a whole new world of flora, fauna and minerals was open to him. But as the colonial arteries hardened, science became an official knowledge with its official hierarchies, rituals, etc., (Saldana, 1987, p. 51).

Colonial expansion required knowledge of the terrain, its people, its resources, etc. No domination could be established without this knowledge. And this knowledge could not be obtained without scientific explorations and surveys. Next to the guns and ships, these were the most potent tools in the hands of a colonizing power. Through them it could afford to know unknown people, chart untrodden paths, and estimate local resources. So surveyors marched by the side of the conquering armies. So the Great Trigonometrical Survey of India (GTSI) was established in 1818. Topographical surveys had military origins and this relationship was maintained throughout (India gets its first civilian Surveyor-General only in 1991!). Geological Survey of India (GSI) came little late in 1851. They started as a part of topographical explorations but as the British rule stabilized, it acquired its own identity and played a major role in the economic exploitation of the country. But botanical explorations had started much earlier, in the eighteenth century itself, in some cases even before. After all the colonies were called plant-ations; they traded in plant products and had a lot to do with botanical knowledge.

An impressive institutionalization alone could have consolidated the gains that accrued from the explorations. It may be interesting to observe how and in what form a particular scientific organization at a particular historical juncture worked for the then - existing politico-economic structure. Geological and Survey institutions, for instance, received the maximum patronage from the government. Next ranked botany. But botanical explorations for long remained in a diffused condition. It could never acquire the structural homogeneity and

cohesiveness of the GSI or Survey of India. This was done deliberately, so that it could be conveniently put to a fairly diversified uses in different locations as the exigencies demanded. Much later, in 1891 the Botanical Survey of India (BSI) was established. Similarly, meteorological observations and data were important for a sea-faring colonizer and an agro-based colony. It perhaps received the most attention after the GSI and GTS. In 1875 was formed a Meteorological Department. Agriculture remained a Cinderella till the 1890s, though a few private agricultural and horticultural societies did try to give it a commercial drift. Private scientific bodies were often more vigorous than the government machinery itself. Still it was under the East India Company, perhaps for the first time in Indian history, that the state had emerged as the producer of knowledge and the sole arbiter of what was to be delivered and to whom.

As the Company rule in India owed its origin primarily to mercantilist activities, the notion of 'science for profit' makes an early appearance. Yet, in the early stage, the colonial scientists (those days mostly surgeon-naturalists) had more freedom and flexibility. There were tremendous difficulties but also enormous opportunities to discover and sight new things. Support from metropolitan scientists added to their confidence and their agenda was not entirely derivative. They did enjoy a certain amount of autonomy and they too influenced metropolitan discourses (for example, on the deposition of coal-seams, nature of cholera, etc.). A noted environmental historian has shown that the idea of environmental conservation came from the colonies, and colonial planters, botanists and foresters contributed a great deal to the initiation and maturation of conservation debates in the metropolitan circles (Grove, 1995).

4. Tightening Grip

Especially after the Crown takeover in 1857, one finds the emergence of state-science on a firm footing. State involvement made colonial science more utility-oriented. Changing economic needs, the proliferation of scientific establishments, and the growing concern shown for them by the educated Indians made the government to think in terms of an apex body to regulate scientific affairs in India. In 1898, at the instance of the Home Government, the Royal Society formed an Indian Advisory Committee, and in 1902 the Government of India established a Board of Scientific Advice. These experiments unfortunately generated more heat than light and ended in a whimper (MacLeod, 1975). Still these institutions had brought the government, science, and economic consideration into a close relationship. The economic interest-group desired research to gain immediate and practical ends. The economic ramification can well be spotted in the growth of industries fed on applied science, viz. coal, cotton, jute, tea, etc. One may argue that scientific development in British India should be treated as individual romances with natural history without linking them with the political economy of the time. But where natural sciences would be without industry and commerce? The light of science had certainly been dimmed by the smoke of commercialism.

Excessive government control of scientific undertakings often hampered the logical development of modern science in India. The government would always goad the various organizations to work only along economically beneficial lines. Most of them buckled under this pressure. Watt, for example, was asked in 1903 to prepare an abridged volume of his famous Dictionary of Economic Products. But he was not given a free hand in selecting the products. He was asked to include only those which were of commercial value. The result was that instead of a Dictionary of Economic Products, he produced a Manual of Commercial Products (Kumar, 1995, Ch.5).

Colonial researchers often found themselves unable to distinguish between 'basic'

research and 'applied' research. This was particularly true of the geologist and botanists. Their dilemma was fairly acute. On top of it, though the colonial government would always recognize the importance of science, it would never approve of any large outlay upon them which must, however useful in its remote results, be immediately 'unremunerative'. Some of the specialists (especially the botanists) felt slighted. A few received a great deal of attention while others none; for example, large sums were spent on geological explorations and nothing on the examination of agricultural soils. George Watt thought it 'absurd to suppose that the Geology of India requires fourteen European experts, while the Agriculture and the Industries of India must be content with two or three expert investigators (Watt, 1902).'

Indians craved autonomy, no doubt, but the British scientists working in Indian establishments also wanted more independence from metropolitan London control. Independence, in addition, would give the Government of India authority to ensure more 'utility-oriented' work. With the creation of the Board of Scientific Advice (BSA) by Governor -General Lord Curzon in 1902, two important shifts could be seen in the government's attitude. One was the idea that science in India could and should be cultivated without supervision from London; and the second was that the country's preference for the 'natural history' sciences must be replaced by public sponsorship of industrial technology (MacLeod, 1975). This was a sort of official version of the *Swadeshism* then raging in the country. But there was no question of any talk, much less cooperation, between the official promoters of scientific independence and the *Swadeshi* leaders who aimed at 'real' independence. The Board of Scientific Advice was a purely interdepartmental British affair; Indian scientists or leaders were given no role in it. The goals of the two groups were similar, but their methods were different. And opinions remained sharply polarized in both camps: some emphasized the glory of 'pure' science, others (probably the majority) stressed the relevance of 'applied' science. The *Swadeshi* leaders were themselves divided (Raina and Habib, 2004, pp.83-147). Government officials were even more ambivalent.

Eventually, some hesitant steps were taken by the Indian government. In 1911, an Indian Research Fund Association was created to foster medical research and public health. Three years later, an Indian Science Congress Association was formed that, at its very first meeting, urged the government to recognize the paramount claims of science upon public funds. A Royal Commission on Agriculture was constituted in 1926 which recommended the establishment of an Imperial Council of Agricultural Research (ICAR). In face of the increasing nationalist demand for greater Indianization of the different services and also in view of the incessant bickering among the various departments, Thomas Holland planned a reorganization of the scientific services in India. This was opposed by many who preferred to enjoy more autonomy under provincial or local administrations. The Acts of 1919 and 1935 had conceded to the Indians considerable share in administration. Yet the colonial juggurnaut continued to roll, albeit haltingly. From the Indian side, there was not let up. Pressure continued which not only harped on the government's reluctance but also threw open internal inconsistencies. Where to go, how to go; and to this debate every thinking-Indian contributed. The notions of science and its terminologies entered so deep in the political and cultural lexicon of the country that no politician or social reformer could afford to ignore them (Kumar, 2006, ch. 7).

The last decades of the Rāj saw some flickers of 'constructive imperialism', but these came too late. Establishment of the Council of Scientific and Industrial Research (CSIR) in 1942 is one such example. By then, nationalism had gathered strength; Indian leaders and the government raced to raise development issues and

debate the role of science and technology therein. By 1945 many committees had been formed and reports published, and the push was on to make India a modern nation-state. At first sight, there seemed to be unity of purpose, but in reality this was not so. The British government had its own agenda and preferences while the national leaders scripted advices and raised demands. The contradictions and dilemmas of Victorian India were not to evaporate quickly. Yes, the interlocutors had little choice but to work for both material benefits and traditional values. They wanted the best of both the worlds, and in the process they strove for more autonomy and power.

5. Educational Institutions

Purely scientific education did not fit into the exigencies of the Company Rāj. But the need was felt to have a class of apothecaries, hospital assistants, surveyors, and mechanics to serve the fast-growing medical, survey and public works departments. Training native youths was obviously much cheaper than getting technical personnel from abroad. So was opened in 1835 the Calcutta Medical College and in 1843 an engineering class at the Hindu College. In 1844 was revived the idea of having a Professor of Natural and Experimental Philosophy. But the controversy arose whether the emphasis was to be put on pure science or on applied science. Around same time F J Mouat, Secretary of the Council of education, floated the idea of establishing a university (Mouat, 1845, pp. 57-62). But it was only to be a mere examining body and thereby could not have given a boost to science education as such.

University system could not dispel the air of pessimism, which hung round science education. Rather it got accentuated in the name of liberal education. Physical sciences were removed from the list of necessary (viz, languages, history, mathematics and mental & moral science) subjects for B. A. Examination (Selections, 1867). An influential contemporary journal wrote: More useful knowledge is to be gained from the study of one page of Bacon's prose, or of Shakespeare's poetry than from a hundred pages of Euclid (*Calcutta Monthly Journal*, 1838). Against this backdrop began the Victorian era.

It was not that the natives were not receptive enough. That the students reciprocated well can be found in what J Prinsep wrote to O'Shaughnessy after examining the chemistry student of Calcutta Medical College: 'All the essays are extremely creditable; indeed the extent and accuracy of the information has far surpassed my expectation and I do not think that in Europe any class of chemical pupils would be found capable of passing a better examination' (*Calcutta Monthly Journal*, 1837).

Vernacular periodicals like *Samvād Prabhākar*, *Tattvabodhinī Patrikā*, *Somprakāśa* etc. every now and then harped upon the importance of science education and research. *Somprakāśa*, for instance, observed that 'in a country like France even at the primary level or at the very ordinary school sufficient attention is given to science. In India the study of true science is negligible. It remains limited to the Roorkee Engineering or Medical Colleges. In 1869 the Asiatic Society proposed that science should be studied properly at the university level right from the Entrance. But the Govt. refused by saying that the time was not yet ripe. Is not the Education Department the cause of our scientific and technological backwardness?' (Ghosh,1966, p.530).

Although the Calcutta University was avowedly founded on the model of the London University, the Oxbridge tradition was apparent in the exclusion of science (*Nature*, 1872). The education system led to the acquisition of literary, rather than of scientific tastes. Bombay was the only University to confer a separate degree in science. The scientific course in Bombay, Lahore and Calcutta were almost similar, except that English which formed a compulsory subject at

Calcutta, was altogether excluded from the two former and that Mathematics, optional in Bombay, was a compulsory subject at Calcutta and Lahore (Croft, 1888, p.147). Quantitatively science course was less popular but it gave better results and was preferred by scholarship holders. In 1882 the DPI of Bengal reported that the percentage of success was 20 in literature course and 46 in the science course (DPI Report, 1892). Science course continued to grow in popularity and in 1899 the Calcutta University decided to institute the degrees of B.Sc. and M.Sc. The result was that Calcutta University was able to produce several science luminaries during early twentieth century.

The British educational experiments in India have been severely criticized. Education was no doubt an important segment of the whole colonial enterprise and was definitely meant to strengthen it. Viswanathan calls it a 'mask of conquest' (Viswanathan, 1989), and Goonatilake considers it a tool for 'cultural blanketing' (Goonatilake, 1982). Are these sweeping judgments? S Ambirajan raises the important question as to whether the system was planned and erected for just this aim or whether there were other forces that brought about the same results. He believes that chance, more than foresight determined the future. 'There is a bureaucratic momentum', he argues, 'which propels institutions along a path, though not necessarily the one charted by the initiators' (Ambirajan, 1995). 'Chance' and 'bureaucratic momentum' are valid arguments if we do not lose sight of the fact that it was a colonial bureaucracy. This bureaucracy ensured the primacy of colonial requirements. Engineering colleges existed for the Public Works Department and were called 'civil' engineering colleges (Kumar, 1989, pp.1-75). The nature and pattern of engineering education in India differed from that of Britain. Whereas in England it evolved from below and gradually became a part of the University curriculum, in India it was organized from above. Though it was organized from above in France also, the motive and situation differed greatly. In Europe, engineering education was developed in order to facilitate the process of industrialization. In India there was no such imperative. Here hope was pinned not on 'material' but on 'moral' uplift. In fact, the whole aim of colonial education was 'moral development' and 'character formation'. The 'native' character was considered defective, immoral and superstitious. The 'new' education armed with western rationality was supposed to correct it. But the PWD-oriented education or an assistant-surgeon producing medical institutions could not have achieved this.

Worried over the government's understandable apathy, some Indians took new intiatives. The foremost among them was Mahendralal Sircar who in 1876, after a great deal of effort and controversy, established the Indian Association for Cultivation of Science (IACS) in Calcutta. This event was no less important than the establishment, nine years later, of the Indian National Congress, a political forum that was to spearhead the national movement. The Association was a cultural challenge and symbolized the determination of a hurt psyche to assert and stand on its own in an area that formed the kernel of Western superiority. Another great institution was established by the munificence J N Tata in Bangalore. The scientific contributions of this more than a century old institution is simply immense (Subbarayappa, 1992).

6. Conclusions

The essence of colonialism is dependency, so is that of colonial science. The colonial scientists were offshoots of the metropolitan culture and drew sustenance from it. MacLeod defines metropolitan science as not just the science of Edinburgh of London, Paris or Berlin; but as *a way of doing* science, based on learned societies, small group of cultivators, certain conventions and certain priorities (MacLeod, 1982). The colonial

scientists were also a small group of cultivators; they also established learned societies; but the priorities, realm and scope of investigations were not always determined by them. This made all the difference. It became mostly derivative, and was, in the eyes of the metropolis, some sort of a dependent if not low science, identified usually with data gathering.

There is one more dimension. Natural knowledge serves to confer prestige on the metropolitan power and thereby legitimize imperial control over peripheral territory. But prestige alone could not have been the sheet anchor for the empire. So, the focus had to be on the applied sciences- botany, meteorology, physiology, applied mechanics, etc. I am not arguing that all science at the periphery was applied science for example, the astronomical observations. But colonial science was primarily science applied to production of systematic knowledge about the colony (its flora, fauna, minerals and topography) and the solution of certain practical problems of the day. Certain material benefits did accrue and some 'development' did take place. But here the key question arises: whose development and for whom?

A significant feature of this phase is the relative neglect of medical and zoological sciences and this is in sharp contrast to larger investments 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. Western medical classes, for instance, were started in 1822, but it took another thirty years to produce the first exhaustive compilation of information on tropical disease in India (Morehead, 1856). The treatment and study of tropical diseases was undertaken by individuals who were separated both geographically and professionally and so, naturally, a consistent body of knowledge failed to develop (Worboys, 1979, p.88). This was true for every branch of knowledge.

Another important feature of the 19th century is the almost total absence of pure or theoretical research. Research activities in science like physics and chemistry which had by then reached' a professional stage' in Europe, were hardly noticeable in India. In the Centenary Review of the Asiatic Society, P N Bose apologetically wrote: 'Our chapter of chemistry at the Asiatic Society is near being as brief as the proverbial chapter on Snakes in Ireland (Bose, 1884, p. l01).' India was found suitable only for field research. She was in fact used as a 'vast storehouse' with exotic varieties of flora, fauna and minerals which were to flood the European laboratories for many years to come. The real research was thus to be done in the metropolis. India could get only ancillary units. And this happened in a century when England itself was undergoing a phase of transition wherein professional scientists, the government and industrialists who understood the full potentialities of science, were all attempting the very difficult task of integrating science into the English government, industry and education. In India the story was, however, different. Here scientific explorations brought the government, science and economic exploitation into a close relationship. But the Indians and India's interests were left largely in the cold. It was only at the turn of the century that certain original contributions from the Indian started coming. Some Indians had taken certain initiatives which were simply exemplary (for example, the Indian Association for Cultivation of Science and the Indian Institute of Science). Lot more centres and departments were established in different parts of the country which played a crucial role in their own way and in their own sphere. Among these could be counted the numerous agricultural experimental farms, vaccine institutes, botanical gardens, engineering and medical schools and colleges along with inter-

disciplinary science departments at different universities. All this laid the institutional foundation on which independent India could later build the world's third largest techno-scientific resource.

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