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Teaching and Research in Colonial Bombay

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Introduction

This article seeks to foreground the fact that in Bombay, a city and Presidency predominantly founded and sustained on mercantile interests (unlike Madras and Calcutta), education itself became a commodity, and the broader commercial context shaped its academic contours, particularly in the sponsorship of scholastic ventures through personal investment. For example, the Royal Institute of Science was inaugurated with great fanfare in 1920 by George Clarke, first Baron Sydenham of Combe (1848–1933), Governor of Bombay, with the mission of imparting scientific knowledge to Indians, inasmuch as it might contribute to a vibrant industry. The Institute was the first in the city of Bombay founded to disseminate specialised scientific education, but with a clear industrial motive.[1] An establishment like this was in stark contrast to attitudes displayed in Calcutta almost exactly a century earlier when an appeal by Raja Rammohan Roy (1772–1833) to Governor-General Lord Amherst (1773–1857) for training Indians in Western science was rejected.[2]

The original 1903 conception of the Royal Institute had received a decided fillip when buildings were constructed for it in 1915. In 1903, at the Industrial Conference in Bombay, presided over by Dorabji Tata (1859–1932), Harold Hart Mann (1872–1961), Agricultural Advisor to the Government of Bombay, moved a resolution to create a technological

[1] Significantly, an entity devoted to science had already come into being in the country in 1909. This was the Indian Institute of Science located in Bangalore, the brainchild of Jamsetji Nusserwanji Tata (1839-1904), who was ironically based in Bombay and did not live long enough to see his project come to fruition.

[2] Uma Das Gupta, 'Introduction' in Uma Das Gupta (ed.), *Science and Modern India: An Institutional History: c. 1784-1947,* xil-lxxvii, endnote 47.

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faculty in universities. He faced a deep-rooted prejudice against technology; delegates to the Industrial Conference believed that culture was 'only obtainable through literary pursuits, and that those who studied technology belonged to a lower level of civilisation and culture'.[3] Mann's feelings on the subject may have had a considerable deal to do with his own training as an agriculturist. Apart from his aforementioned role, he was also the first Principal of the Agricultural College in Poona, subsequent to its separation from the existent College of Science, with a strong emphasis laid on the practical and experimental.[4] However, the real change resulted with the onset of World War I (1914–1918), where a need for training a mass cadre of scientists, technologists and educators was suddenly felt. The rapid departure of British personnel after the War and the emerging requirement of a trained workforce led to an accelerated growth of educational institutions of science and technology. These events would eventually lead to the University Department of Chemical Technology (now known as the Institute of Chemical Technology) in 1933. This marked a complete shift in attitudes towards technical and applied education in Bombay. Even by then, the University of Bambay had not engaged in offering any courses, contenting itself with administering examinations, setting curricula, awarding degrees and affiliating colleges. In fact, 'scientific education, let alone technological education, formed a marginal part of the higher education curriculum' from the inception of the University in 1857 to the end of World War I.[5] Thus, even modest scientific institutions, such as the Plague Research Laboratory (PRL), started in 1899 by Dr Waldemar Haffkine (1860–1930), became significant in the scientific establishment of Bombay.[6]

In the early nineteenth century, the lack of interest by Lord Amherst (1773–1857) in Rammohun Roy's initiative would not necessarily have been shared by his compatriots. After all, among the British Presidencies in India, Bengal had, 40 years earlier, taken pride of place for the establishment of a savant society in Calcutta. Called the Asiatic Society of Bengal, it had, almost from its inception, proven to be a significant locus for the production of knowledge. Founded in 1784 by the erudite

[3] Nasir Tyabji, 'Exemplar of Academia-Industry Interchange: The Department of Chemical Technology at Bombay University' in Uma Das Gupta (ed.), *Science and Modern India: An Institutional History, c. 1784-1947* (gen. ed. D.P. Chattopadhyaya) *History of Science, Philosophy and Culture in Modern India*, xv.4 (New Delhi, 2011), 927-946, esp. 930.

[4] Kishor D. Gaikwad, 'Poona Agricultural College: Catering to the 'Colonial Food' Requirement, 1908-47 in Uma Das Gupta (ed.), *Science and Modern India: An Institutional History, c. 1784-1947*, 311-26, esp. 324.

[5] Nasir Tyabji, 'Exemplar of Academia-Industry Interchange', 927.

[6] Pratik Chakrabarti, *Bacteriology in British India: Laboratory Medicine and the Tropics* (Rochester, NY, 2012), 51.

puisne judge in Calcutta, Sir William Jones (1746–1794), the society sought to replicate the form of the Royal Society in London, but with a very definite focus on the study of Asian languages, customs and traditions, along with a plethora of other desiderata.[7] The other Presidencies would follow suit in the early nineteenth century. While Madras had taken the lead in securing an official naturalist, Johann Gerhard Koenig (1728–1795) in 1778, a more general approach to the aims stated for the Asiatic Society of Bengal would be attempted only in 1812 through the formation of the Literary Society of Madras. This was at the instance of Sir John Newbolt (1769–1823), Chief Justice of the Supreme Court of Judicature in Madras, aided by the physician Benjamin Guy Babington (1794–1866), the first Secretary of the Civil Service. In 1829, a distinct body known as the Auxiliary of the Royal Asiatic Society was created in the same city. A year later, both Societies merged under the umbrella of the organisation in London to become known as the Madras Literary Society AND Auxiliary of the Royal Asiatic Society.

The stirrings of a learned enterprise were felt in Bombay nearly a decade before Madras. With respect to the sciences, a Presidential address to the newly constituted Literary Society of Bombay (1804), by Sir James Mackintosh (1765–1832), the Recorder (Chief Judge of Bombay), was duly couched in these terms:

> The Physical Sciences afford so easy and pleasing an amusement; they are so directly subservient to the useful arts; and in their higher forms, they so much delight our imagination and flatter our pride, by the display of the authority of man over nature, that there can be no need of arguments to prove their utility, and no want of powerful and obvious motives to dispose men to their cultivation. The whole extensive and beautiful science of Natural History, which is the foundation of all physical knowledge, has

[7] Jones declared the object of the Society to be the 'investigation of whatever is rare in the stupendous fabric of nature; correcting the geography of Asia by new observations and discoveries; tracing the annals and eve traditions of these nations….and bringing to light their various forms of government, with their institutions, civil and religious; examining their improvements and methods in arithmetic and geometry—its trigonometry, mensuration, mechanics, optics, astronomy and general physics; their systems of modality, grammar and rhetoric and dialectic; their skill in chirurgery and medicine, and their advancement, whatever it may be, in anatomy and chemistry. To this you will add researches into their agriculture, manufacture and trade, and, whilst you enquire into their music, architecture, painting and poetry, will not neglect those inferior arts, by which comforts, and even elegances of social life, are supplied or improved. If now it be asked, what are the intended objects of our enquiries within these specious limits, we answer, Man and Nature; whatever is performed by the one, or produced by the other.' From the 1st Discourse by the President, quoted in C.R. Chaudhuri, *The Asiatic Society* (Calcutta, 1995). For a general history of the Asiatic Society, see O.P. Kejariwal, *The Asiatic Society of Bengal and the Discovery of India's Past, 1784-1838* (New Delhi, 1988).

> many additional charms in a country where so many treasures must still be unexplored.[8]

The Literary Society of Bombay merged with the nascent Royal Asiatic Society of Great Britain and Ireland (founded 1824) that same year.[9] Modelled after and inspired by the learned societies of the period, this would become the first institution in the Bombay Presidency to nurture empirical knowledge of the natural world. Initially, the focus seems to have been on antiquarian pursuits, along with Sanskrit literature, philology, archaeological remains, ethnographic descriptions, and religious practices.[10] There was limited engagement with natural history in the early years, though it was desired. As the President of the Society, Rev. John Wilson said in his address in 1836, 'there are in our Transactions only a few distinct contributions'. He then urged the Society to imitate the Asiatic Society of Bengal in that regard, so also in its focus on geology, botany, and zoology.[11]

By the time Sir George Birdwood (1832–1917) came to the city of Bombay in 1857, the state of scientific collection and publication had completely changed. Birdwood was appointed Acting Professor of Anatomy and Physiology in Grant Medical College, which had been established in 1845 in memory of the former Governor of Bombay, Sir Robert Grant (1779–1838). On his travels through the Deccan, Birdwood sent drawings, dried plants, stuffed birds and other items of natural history to the newly formed Central Museum of Natural History, Economy, Geology, Industry and Arts in Bombay. This museum was founded in 1855, but closed to the public in 1857 and its collections moved to the Town Hall, before disbursal to a number of museums of the city, the chief beneficiary being the Victoria & Albert Industrial Museum (opened in 1872).[12] Pleased with Birdwoood's efforts, Lord John Elphinstone (13th Baron, 1779–1859), Governor of Bombay, appointed him Secretary and Curator of the collections in the Town Hall, which would result in the establishment of the Victoria & Albert Industrial Museum, not least in part to house them.[13] Birdwood's personal interest in research in science and medicine, his engagement with public education, and his stewardship of several institutions led to a unified

[8] Quoted in K.R. Kirtikar, 'Progress in Natural History during the last Century', *The Journal of the Bombay Branch of the Royal Asiatic Society,* Extra Number – The Centenary Memorial Volume, Part V. Science Section. 1 (1905), 353-81.

[9] 'Brief History', Asiatic Society of Mumbai website [http://asiaticsociety.org.in/index.php/about-us/history-asiatic] accessed 25th July 2018.

[10] Mrinal Kulkarni, *Sir James Mackintosh* (Mumbai, 2014), 70-80 *passim*.

[11] Rev. John Wilson, 'Address read before the Bombay Branch of the Royal Asiatic Society, on the 27th January, 1836', *The Madras Journal of Literature and Science*, 4 (July-October 1836), 443.

[12] Vijaya Gupchup, *Sir George Birdwood* (Mumbai, 2014), 3-4.

[13] Ibid, 4.

vision on his part. Birdwood had also championed the inclusion of Indians in many of these institutions, making them truly public.[14]

Thus, the middle two decades of the nineteenth century witnessed a revolution in the scientific establishment within the Bombay Presidency. New institutions such as museums were envisioned to house scientific collections, the University of Bombay was established (1857), and Victorian polymaths like Birdwood were serving in India, for decades at a time, founding and running the institutions of knowledge production that would supplement the rather meagre role of the university in the promulgation of science.

The foregoing discussion reveals a number of issues. Central to them is the multiplication of scientific disciplines in the early decades of the nineteenth century (for instance, natural history ceding place to botany, zoology, and geology), a feature amply described by Michel Foucault in *The Order of Things* (1966). Another key element is the matter of inclusion. The Asiatic Societies in India were notably chary in terms of admitting native members – ironically, it took the welcoming of a Parsi, Manekjee Cursetjee (1808–1887) into the Royal Asiatic Society in London, after he had been refused entry to the Bombay Branch on grounds of his race, for the matter to be reconsidered favourably for him, given that his continued exclusion from the Bombay chapter would have been ludicrous. Admittance would facilitate engagement and the possibilities for greater native participation, though this would still remain minoritarian through the nineteenth century.

Allied to such inclusion was a major rift owing to the importance given to Western education versus that in the vernacular, a battle that would result decidedly on the side of the former through a series of imperial interventions, particularly Macaulay's notorious 1835 Minute on Education.[15] A flamboyant 50-round salute attended the first dissection of a human body by a native surgeon, Madhusudhan Gupta, a year later at the Calcutta Medical College.[16] Yet, despite these successes, there was little attention paid to a general training of native students for anything other than teaching, a tendency that would be central to the mandates of the Presidency universities upon their establishment in 1857.[17] Affiliated

[14] Ibid, 5.

[15] T.B. Macaulay, 'Minute on Indian Education' in John Clive and Thomas Pinney (eds.), *Selected Writings* (Chicago, 1972 (1835)).

[16] David Arnold, *Colonizing the Body: State Medicine and Epidemic Disease in Nineteenth-Century India* (Berkeley/Los Angeles/London, 1993), 6.

[17] Identical preambles marked the Acts of Incorporation for the three universities, defining their objects to ascertain 'by means of examination the persons who have acquired proficiency in different branches of Literature, Science and Art and of rewarding them by Academic Degrees as evidence of their respective attainments.' In Suresh Chandra Ghosh, *The History of Education in Modern India*, 1757-2012, Fourth Edition (Hyderabad, Telangana, 2013), 85.

colleges were given no control over the courses required with 'their only function', 'to prepare students for examinations conducted by the university'.[18]

By the mid-nineteenth century, however, public engagement in science education existed in at least some version of these primary institutions. Very soon, local expression of this pedagogy was formulated when European-language works were slowly translated into vernacular languages. By the 1850s, there were books published in Bengali on most branches of science.[19] In 1868, the Bihar Scientific Society was set up with the mission of translating European scientific works into vernacular languages.[20] It was closely modelled on the Scientific Society of Aligarh founded by Sir Sayyad Ahmad Khan in 1864, which translated scientific works in English and other European languages into Urdu.[21]

Rammohun Roy had looked to the British East India Company for patronage in the early 1820s, and it was again in Calcutta that a significant moment of direct native intervention instead occurred. This was the formation of the Indian Association for the Cultivation of Science in 1869 at the instance of Dr Mahendra Lal Sircar (1833–1904), a leading Bengali social reformer and practitioner of both allopathy and homoeopathy.[22] Nationalistic temper was also to make itself manifest through the establishment of the Bengal Chemical and Pharmaceutical Works in 1887 by the University of Edinburgh-trained Prafulla Chandra Ray (1861–1944)[23] and the experimental demonstration of Hertzian waves by Jagadish Chandra Bose (1858–1937) at Presidency College,[24] both events occurring in Calcutta as well. Not to be outdone in terms of educational philanthropy, the Bombay-based Sir Jamsetji Nusserwanji Tata (1839–1904), a Parsi industrialist, endowed a new institution envisaged on the lines of Britain's Imperial Institute to the tune of three million rupees at the turn to the 20th century, which would eventually be located in

[18] Ibid, 86.

[19] Uma Das Gupta, 'Introduction', in Uma Das Gupta (ed.) *Science and Modern India* (Gen. Ed. D.P. Chattopadhyaya) *History of Science, Philosophy and Culture in Modern India*, xv Part 4, xil-lxxvii, esp. xli.

[20] V.A. Narain, 'The Role of Bihar Scientific Association in the Spread of Western Education in India' in *Proceedings of the Indian History Congress* -1969, 421-4.

[21] H.K. Sherwani, 'The Political Thought of Sir Syed Ahmad Khan' in *The Indian Journal of Political Science*, 5/4 (1944), 306-28, esp. 311.

[22] Pratik Chakrabarti, *Western Science in Modern India: Metropolitan Methods, Colonial Practices* (New Delhi, 2004), 150.

[23] Dhruv Raina, 'Ray's Life and Experiences as a text on the history of science', in Santimay Chatterjee, M.K. Dasgupta and Amitabha Ghosh (eds.), *Studies in History of Science* (Calcutta, 1997), 25–42, esp. 28.

[24] Jon Agar, *Science in the Twentieth Century and Beyond*, (Cambridge, 2012), 17.

Bangalore, coming into being in 1909 under the name the Indian Institute of Science.[25]

It was in such a context of both the centralising impulse of empire and the reactionary response of nationalists that two chemists, J. L. Simonsen of Canning College, Lucknow, and P. S. Macmahon of Presidency College, Madras, proposed the introduction of an annual Indian Science Congress, arising from their disappointment that original research at the level of the university in India was wanting,[26] well over half a century after the establishment of those in Madras, Bombay and Calcutta. The first Congress was held in 1914 in Calcutta under the presidency of the renowned lawyer and then Vice-Chancellor of Calcutta University, Sir Ashutosh Mukherjee (1864–1924), with one-third of the papers being read by Indians. It was this important period in the 1910s that would allow for the formation of such a research-oriented establishment as the Royal Institution of Science to come into being by 1920 in Bombay.

Every colonial institution and congress was facilitated by the rise of a set of nineteenth-century bodies. In what was the most important British city in western India, these were dominated by a group of seven institutions. In chronological order, they were: 1. The Bombay Branch of the Royal Asiatic Society (originally established as the Literary Society of Bombay, 1804), 2. the Victoria and Albert Industrial Museum (indirectly conceived in 1855 and built in 1871), 3. the University of Bombay (1857), 4. the Bombay Natural History Society (1883), 5. the Haffkine Institute (1899), 6. the Royal Institute of Science (envisioned in 1903 and established in 1920) and 7. the Prince of Wales Museum (imagined in 1904 and brought into being in 1922). Brief accounts of these institutions are essential to understand the role of the dissemination of science in the Bombay Presidency in particular, and colonial India in general.

The Institutions

The Bombay Branch of the Royal Asiatic Society

Founded in 1804, as a forum to contribute to the knowledge of Asia in all fields, the Bombay Branch of the Royal Asiatic Society was ably guided by a number of office-bearers drawn from the ranks of administrators and

[25] David Arnold, *Science, Technology and Medicine in Colonial India*, (Cambridge, 2000), 161.

[26] Colleges and universities began early—a case in point being Hindu College (later Presidency College) in 1818. With the mid-nineteenth-century origination of the Universities of Calcutta, Bombay and Madras, there was an effort to include a number of subjects across the board roughly equivalent to those found in Britain. Nonetheless disciplines like zoology still found short shrift until the dawn of the twentieth century.

educators in the Bombay Presidency. The Society never formally conducted classes or examinations, and even most of the research, barring the library, was pursued at the initiative of individual members. Enterprising members of the Society, who were otherwise employed as administrators, military men, civil engineers, and physicians, undertook research that was aligned with their own wide-ranging interests, to which *The Transactions of the Bombay Branch of the Royal Asiatic Society* was a testament. The Society filled the role for providing informal education and furthering new exploration in the absence of genuine state-sponsored research institutions in the Bombay Presidency for almost a hundred years. With the creation of specialised research institutions, covered below, the role of the Asiatic Society was trimmed down to philological, linguistic, historical and cultural fields.

The Victoria and Albert Industrial Museum

Established chiefly through the efforts of Birdwood and his great friend Dr Bhau Daji Lad (1822–1874), among others, the oldest extant museum in the city (opened 1872), the Victoria and Albert Industrial Museum (now renamed the Bhau Daji Lad Museum) was among the earliest institutions to promote a union of arts and traditional crafts, besides being the first building specifically constructed to house a museum, which to the colonial mind, represented native industry.[27] As a result, the museum became the locus of extensive research into craft practices, including the study of properties for material to be commercially exploited (for instance, coir or different kinds of wood). This kind of institution was replicated in most major cities of British India (e.g. Poona, now Pune) and subordinated princely states (e.g. Jaipur) and performed the dual task of educating the public, and undertaking applied research. The possibilities of commercial enterprise, based upon natural resources, were supplemented by the other great institution for economic botany, namely the botanical garden.[28]

[27] Gupchup, *Sir George Birdwood*, 52-3. Also, see 'Museum Story', Dr. Bhau Daji Lad Mumbai City Museum website [http://www.bdlmuseum.org/about/museum-story.html] accessed 25th July 2018.

[28] The Horticultural Society of Bombay, also realised through the endeavours of Sir George Birdwood, carried out a different kind of research, wherein new gardens were laid out and exotic plants were imported gratis from Liverpool and Zanzibar in exchange for native species; see George Birdwood, *Report of the Government Central Museum and On the Agricultural and Horticultural Society of Western India for 1863* (Bombay, 1864), 72.

The University of Bombay

The Minute by Sir Mountstuart Elphinstone (1779–1859) in 1824 emphasised education primarily in terms of reading and writing to teach natives the skills of administration as a means of 'civilising them'.[29] Elphinstone was, paradoxically, also very keen to ensure that traditional institutions like temples and madrasas in which teaching was done were preserved.[30] But native education in English was already underway with the founding of The Bombay Native Education Society in 1815, which was later merged into the Board of Education in 1840. This body established Grant Medical College in 1845, and the Engineers' Class, attached to Elphinstone College, was shifted to Poona in 1854 as the Engineering Class and Mechanical School.[31] However, colleges in Bombay did not fulfil the role of a university, but merely prepared students for examinations administered in England. With the passage of the Calcutta University Bill in December 1857, the University of Bombay was incorporated, and the Bachelor of Arts, Master of Arts, Bachelor of Laws, Licentiate in Medicine, Doctor of Medicine and Master of Civil Engineering, were degrees that could be conferred by the new University.[32] Up until 1904, the only function of the university was to affiliate colleges, dictate curricula and conduct examinations. The University itself did not engage in any teaching or research. In 1917, Chimanlal Sethalvad was appointed the Vice-Chancellor, a position that he occupied for an unsurpassed six years comprising twelve terms. The Government of Bombay had offered a grant for a School of Research in Economics and Sociology, which was realised during his sinecure.[33] Sir Chimanlal was of the opinion that the university should be directly involved in teaching as part of its mandate. The Royal Institute of Science (founded 1920) applied to the University to be affiliated for the award of a Bachelor's degree in Science, whereas many members of the University wanted the Institute to be admitted as a postgraduate department of study. Finally, in 1925, the University affiliated the Royal Institute but reiterated that the main function of the Institute was research – this was in line with the University's new role of ensuring that it retained control of teaching.[34] However, as

[29] B.D. Basu, *History of Education in India under the rule of East India Company* (Calcutta, 1922), 1.
[30] V. Raghunathan and Veena Prasad, *Beyond the Call of Duty* (Noida, Uttar Pradesh, 2015), 58.
[31] Aroon Tikekar, *The Cloister's Pale: A Biography of the University of Mumbai* (Mumbai, 2006), 10-11.
[32] Ibid, 19. [33] Ibid, 158-9. [34] Ibid, 160-1.

this example illustrates, research was still carried out only in affiliated or independent institutions.

The Bombay Natural History Society

Right from its inception in 1841, the *Journal of the Bombay Branch of the Asiatic Society* had included natural history. Of the five articles contained in the first volume, one dealt with palaeobiology, and was titled 'Note on the Discovery of Fossil Bones of Mammalia in Kattiawar' by Captain Fulljames. The body was locally significant: a call, for instance, to increase the size of the collections of the Museum of Economic Geology in Calcutta found mention very early in the journal's run (No. V, April 1843). In 1883, The Bombay Natural History Society (henceforth BNHS), as it was called, came into being at the instance of eight residents of the city who thought it an 'excellent idea to form a Society for the study of Natural History,' and proposed 'to meet monthly for exchange of notes, for exhibiting interesting specimens, and for otherwise encouraging one another.'[35] There were eight founders, six of whom were European and two Indian: Dr. D. MacDonald, Mr. E. H. Aitken, Colonel C. Swinhoe, Mr. J. C. Anderson, Mr. J. Johnston, Dr. Atmaram Pandurang, Dr. G. A. Maconochie and Dr. Sakharam Arjun.[36] The Society would swiftly assume the mantle of systematic investigations in the subject from the contributors of what were relatively slim pickings in the *Journal of the Bombay Branch of the Royal Asiatic Society*. The *Journal of the Bombay Natural History Society* (henceforth *JBNHS*) was launched in 1886 under the editorship of R. A. Sterndale and E. H. Aitken and printed at the Education Society's Press at Byculla, consisting of four issues and twelve illustrations. The introduction explained the circumstances of the origin of the *JBNHS* and the focus on the subjects under study, which included Mammals and Birds, Reptiles and Fishes, Insects, Other Invertebrates, and Botany.[37]

Two points should be stressed here. First, decided importance was afforded to zoology at eighty per cent, accounting for four out of five sections under study, two vertebrate, the remainder invertebrate. By contrast, botany was treated in total, rather than being sectioned into

[35] Bombay Natural History Society (1883–1983), 'The History of a Century of Natural History. The First Fifty Years, 1883-1933,' *Hornbill*, 7 (1983), 2-23. R.A. Sterndale and E.H. Aitken (eds.), 'Introduction'. *Journal of the Bombay Natural History Society*, 1/1 (1886), 1-3.

[36] The presence of the two native Indians in this organising body, Dr. Pandurang and Dr. Arjun was a remarkably high percentage given the relative paucity of Indians country-wide in the arena of natural history.

[37] Sterndale and Aiken, 'Introduction', 2.

mosses, fungi, ferns, gymnosperms and angiosperms. Second, there was an immediate *raison d'être* provided for the introduction of a journal to meet the needs of naturalists who had been suffering for want of such a vehicle in the Presidency of Bombay (as opposed to the *Journal of the Asiatic Society of Bengal* and the *Journal of the Literary Society of Madras,* the *Journal of the Literary Society of Bombay* and later the *Journal of the Bombay Branch of the Royal Asiatic Society* were decidedly thin on matters of natural history).

The membership of the Society as listed in the first volume indicated an interesting trend. While the vast majority of the 235 names were of British extraction, there were 12 native members as well, over half of whom belonged to the Zoroastrian Parsi community.[38] This was unsurprising—the Parsis had been in the vanguard of exposure to western education in terms disproportionate to their tiny numbers, and this fact translated itself into the realm of interest in natural history in its European inflection as well.[39] Significantly, taking into account the dearth of women sojourning in South Asia who had contributed to natural history in print (with some illustrious exceptions such as Emily Eden (1797–1869) and Fanny Parkes (1794–1875)), there were also five women members, none of whom, however, belonged to the native Indian community.[40]

In the corresponding dearth of representation by Indians and women in the first volume, the former category included one Keswal (included as 'A Member of the Society') who wrote the first part of a series on the 'Waters of Western India' (the others would appear in subsequent volumes) and K. R. Kirtikar who had several contributions on botany. The latter was represented by Mrs. W. E. Hart, whose offering was also botanical, in describing a root parasite. That, however, was the sum of the matter – three individuals, two of whom were disproportionately represented

[38] Jehangir Manekjee Cursetjee, Sorabjee D. Dubash, Babajee Gopal, K.R. Kama, Rustom K.R. Kama, Diasha P. Kanga, Surgeon K.R. Kirtikar, Ragoonath Mukund, K.D. Naigumwala, Rev. Danjibhai Naoroji, Ardeshir Shapurji Panday and Sorabjee Cavasjee Powwalla.

[39] Not merely in education and politics but even in sports. Please see for instance, R. Guha, *A Corner of a Foreign Field* (Delhi, 2002), for the pivotal Parsi contribution to the development of cricket in India.

[40] Miss Dewar, Mrs. W.E. Hart, Miss Johnstone, Mrs. H.S. Symons, and Mrs. Thomson. Only Mrs. Symons appeared to be associated with the Society along with other members of her family from the names on the roster, though Mr. W.E. Hart would also become a long-standing member of the Society. It is also interesting that two of the lady members are spinsters, indicating a certain level of independent initiative in a largely male-dominated society. See E. Eden, *Up the Country: Letters to her Sister written from the Upper Provinces of India* in two volumes (London, 1866); and F. Parkes, *Wanderings of a Pilgrim, in Search of the Picturesque, during Four-and-Twenty Years in the East; with Revelations of Life in the Zenana* (London, 1850).

owing to multiple articles authored by them. It would take time for more Indians to contribute, as indeed, European women. Even more time (over three quarters of a century) would need to elapse for contributions by Indian women. Nonetheless the Society and its journal would undoubtedly provide the chief activity of natural history through much of the twentieth century, and indeed continues to play a significant role in this regard to the present day.

The Haffkine Institute

The Third Pandemic of the Plague had found its origins in Hong Kong and southern China in 1894 and two years later struck the Bombay Presidency with tremendous ferocity. Over the next fifty years, even as the intensity of the disease waxed and waned, there were up to 15 million deaths worldwide, of which approximately 12 million were in India alone.[41] The colonial government was slow to respond, even as state intervention reigned, rumours abounded, riots resulted, and mass flight occurred from cities.[42] As a result of a threat of an embargo on goods from India in 1897, the Epidemic Diseases Act in February 1897 was passed.[43] The legislation 'authorised the health authorities to confiscate or destroy any property including houses) that they believed to harbour the disease; gave them the right to prohibit fairs and festivals where these might endanger public health; permitted the hospitalisation and segregation of suspected plague victims; allowed the rapid disposal of the dead to prevent the spread of disease; and instituted systematic inspection of travellers by road, rail, and sea to search for physical signs of infection and detain plague suspects'.[44] The result was widespread fear and rumour-mongering in both the Western educated Indian elite and the less fortunate masses. The unpopular Plague Commissioner in Poona, Walter C. Rand, was a direct casualty, assassinated on the 22nd of June 1897, at the hand of three Chitpavan Brahmins, the Chapekar brothers.[45]

That same year, nearly 400,000 people, approximately half the population of the city, fled Bombay.[46] Some measure of addressing immediate discontent was attempted through the anti-plague serum

[41] Myron J. Echenberg, 'Pestis Redux: The Initial Years of the Third Bubonic Plague Pandemic, 1894–1901' in *Journal of World History*, 5/2 (2002), 429-49.

[42] David Arnold, 'Disease, Rumour, and Panic in India's Plague and Influenza Epidemics, 1896-1919' in Robert Peckham (ed.), *Empires of Panic: Epidemics and Colonial Anxieties* (Hong Kong, 2015), 112.

[43] Arnold, *Colonizing the Body*, 205.

[44] Arnold, 'Disease, Rumour, and Panic', 114.

[45] Kalpish Ratna, *The Quarantine Papers* (New Delhi, 2010), 230-1.

[46] Arnold, 'Disease, Rumour, and Panic', 116-17.

developed by Waldemar Haffkine (1860–1930), a Jewish Ukrainian bacteriologist trained in Paris, who had, half a decade earlier, assisted in addressing an outbreak of cholera in Calcutta. Haffkine's serum itself would, after a contaminated sample over which he had no direct control was disseminated, compromise his work and standing in the country.[47] Nonetheless, the plague pandemic did allow for the systematic employment of a laboratory-derived antidote from within the confines of a nation hitherto under thrall to more environmental considerations in the treatment of disease, rather than those of pathogens.

The locus for the production of the antidote that was being developed by Haffkine was known as the Plague Research Laboratory, out of what was called Room 000, originally housed in the Pharmacology Department of Grant Medical College.[48] As mentioned in the introduction, the Plague Research Laboratory (PRL), was started in 1899 by Haffkine, accompanied by 'one native clerk and three peons lent by the municipality' in one room.[49] In 1906, the PRL would become the Bombay Bacteriological Laboratory (BBL), only to be renamed the Haffkine Institute in 1925, an irony, given the obloquy into which his name had fallen in the early part of the century. The scope and strength of this institution improved rapidly through the first two decades of the twentieth century, as the BBL became a provisional laboratory for general diagnosis and research funded by the government of Bombay and the Indian Research Fund Association.[50]

The power differential that extended to the roles of European versus native practitioners was entrenched. When Dr A. G. Viegas (1856–1933) became the first person to detect a case of the plague in Bombay, he was a member of the Bombay municipal standing committee, under whose remit was the responsibility of controlling the disease.[51] Viegas was a local physician, of Goan extraction, with a thriving practice in Mandvi, whose suspicions regarding the rebarbative symptoms of a woman on whom he had been called to attend in Pydhonie on the 18th of September 1896, had led to his determination of her illness as the plague. This fact was duly confirmed on the 23rd of September by a standing committee, leading to the then

[47] Arnold, *Science, Technology and Medicine in Colonial India*, 143.

[48] For an exhaustive account, if couched in fiction, please see Ratna, *The Quarantine Papers*, and Kalpish Ratna, *Room 000: Narratives of the Bombay Plague* (New Delhi, 2015).

[49] Chakrabarti, *Bacteriology in British India*, 51.

[50] This was the forerunner of the Indian Council of Medical Research, founded in 1911. For the role of the BBL as a research and public health laboratory, see Mridula Ramanna, 'The Haffkine Institute, 1899-1947', in Uma Das Gupta (ed.), *Science and Modern India: An Institutional History, c. 1784-1947*, History of Science, Philosophy and Culture in Modern India, xv. Part 4 (New Delhi, 2011), 573.

[51] Mridula Ramanna, *Health Care in Bombay Presidency, 1896-1930* (New Delhi, 2012), 11.

Governor of Bombay, Lord Sandhurst, notifying the Governor-General and Viceroy of India, Lord Elgin on the 29th of September, that the plague had broken out in Bombay.[52] Viegas, despite his considerable reputation, did not belong to the Indian Medical Service (IMS),[53] at the time still largely the preserve of white colonial officers (Kirtikar was an exception). It is against this backdrop that his work, as well as that of other native practitioners of Western medicine who did not belong to the IMS, became so important, as did that of Indian supporters of, for example, the Aga Khan, who were in charge of an inoculation station from March to December 1897.[54] One particularly influential figure was Khan Bahadur Dr Sir Nusserwanji Choksy (1861–1939), the physician responsible for the Arthur Road Hospital and the Mahratta Hospital, who through four epidemic outbreaks of the plague would garner the largest clinical experience of the plague in Bombay, with over 4,000 cases.[55] He conducted experiments using eight different vaccines developed by Yersin and Roux, Haffkine and Lustig, as well as others by Terni, Tavel, Palthauf, Brazil and Kitasato, with regular reports sent to *The Lancet* and *The British Medical Journal*. These studies represented 'an important yet little known instance of bacteriological investigations in India, both for its international implications as well as for local factors'.[56]

Part of the issue with the British standing at some point of remove from bacteriology was that it was largely seen as the preserve of continental Europeans, in particular, the French and the Germans. However, what was largely denied in Britain became permissible in British India at the turn of the twentieth century, namely the formation of Pasteur Institutes in various places across the country, from Coonoor to Kasauli, Calcutta to Rangoon. These, along with establishments of government, be it the short-lived Imperial Bacteriological Laboratory in Poona, later shifted to Muktesar (1890), or the still existent Calcutta School of Tropical Medicine (1921), pointed to colonial crucibles of experimentation, where case studies aplenty presented themselves with such outbreaks as the Plague or the Great Influenza. In the years between 1900 and 1914, the Government instituted a number of agencies that would dominate Indian medical research for decades, such as the King Institute in Madras (1904) and the Central Research Institute in Kasauli (1906), the same year in which the Bacteriological Department (later known as the Medical Research Department) came into being. In 1911, the Indian Research Fund

[52] Kalpish Ratna, *Room 000: Narratives of the Bombay Plague* (New Delhi, 2015), 24-5.
[53] Significantly, neither was Haffkine.
[54] Ramanna, 'The Haffkine Institute', 567.
[55] Ratna, *Room 000*, 153.
[56] Chakrabarti, *Bacteriology in British India*, 53.

Association (IRFA) was established for the recruitment and training of medical researchers as well as a conduit for funding both from the government and from private philanthropists. From 1913 its research appeared in the *Indian Journal of Medical Research*, which itself came to be widely regarded for the publication of pioneering research on cholera, hookworm, kala-azar, malaria and the plague. In the meantime, work proceeded at the Plague Research Laboratory in Bombay (1899). With concerted state support, research soared, a significant case in point being the work of W. G. Liston (1872–1950), who made rapid strides in the study of plague in Bombay.[57]

The Royal Institute of Science

As mentioned earlier, the Royal Institute of Science was inaugurated in 1920 (17 years after its actual founding) by Sir George Clarke, first Baron Sydenham of Combe (1848–1933), Governor of Bombay, with the mission of imparting scientific knowledge to Indians; a Principal and other members of staff were appointed.[58] In the interim (by 1915), the buildings had been constructed through financial support obtained even earlier,[59] although the demands of war saw them being utilised as a makeshift hospital.[60] This pecuniary support was forthcoming through private funding from Sir Cowasjee Jehangir (Rs. 400, 000), Sir Jacob Sassoon (Rs. 1,000,000) and Sir Currimbhoy Ibrahim (Rs 450, 000),[61] representing respectively three religious mercantile groups in the city – Parsi, Jewish, and Ismaili, despite the fact that the institution itself fell under the purview of the government.[62] An eminent alumnus was Homi Bhabha, who entered Elphinstone College at the age of 15 after finishing his Senior Cambridge, and went on to conduct research at the Royal Institute of Science until 1927. As a pioneer institution of modern scientific research, well equipped for the prosecution of both undergraduate and postgraduate research (especially in Physics, Chemistry, Zoology and Botany, with

[57] Arnold, *Science, Technology and Medicine in Colonial India*, 144-5.

[58] 'XXI Royal Institute of Science, Bombay' in *Bombay University Calendar, 1928-29 and 1929-30* (Bombay, 1931), 101-3.

[59] Nasir Tyabji, 'Exemplar of Academia-Industry Interchange', 944.

[60] *Bombay University Calendar*, *1928-29 and 1929-30*, 101.

[61] This entry in the *Bombay University Calendar* indicates the relative amounts of emolument afforded by each individual. Sir Currimbhoy Ibrahim specifically mandated that 1 out of the 450,000 rupees was to be reserved for 'Mohamedans attending the institution'. The establishment of the institutional library was supported to the tune of Rs 250,000 by Sir Vasanji Trikumji Mulji, while 500,000 rupees were promised by the Government from Provincial Funds.

[62] Kenneth X. Robbins and Pushkar Sohoni, *Jewish Heritage of the Deccan* (Mumbai, 2017), 41.

training for M.Sc. students in German as well),[63] it was assimilated into the University of Bombay as the latter sought to have an active research programme that matched its teaching mandate,[64] even if it was still held somewhat at bay by the principal objectives of the University.[65]

It is important to recognise that at the time of the inauguration of the institution, much of the administration in other governmental establishments, at least at middle levels, was beginning to pass into native hands, not least because of 'white flight' back to the United Kingdom, following World War I. There was also a recognition on the part of some colonial workers that the transition was not only inevitable but essential, and attention was therefore paid towards careful recruitment of promising native workers. One significant example was the Zoological Survey of India (established in 1916), where the founder-director (also at the time, the Superintendent of the Indian Museum in Calcutta), Thomas Nelson Annandale (1876–1924), rendered yeoman service in this regard. Early impetus for such a turn would be found before the onset of the Great War, however, through the Minto-Morley reforms that culminated in the Indian Councils Act of 1909, where the term 'Indianisation' began to gain currency and which proved to be the 'first notable step in Indianising the political system'.[66] By 1916, as a consequence of the Report of the Islington Commission (1912–1915), the Indian Industrial Commission was established under the Presidency of Thomas Holland (1868–1947), formerly the director of the Geological Survey of India, which emphasized the development of local artisanal and industrial education.[67] It is of particular note that in the same year that the Royal Institute of Science opened its doors, the Institute of Engineers (India) also came into being, where guiding principles urged it to 'welcome engineers, both public and private, and to endeavour to meet the increasing needs of Indians to participate in

[63] *Bombay University Calendar*, 102.

[64] An early Principal and a professor of organic chemistry, Dr A. N. Meldrum, was a known proponent of both undergraduate training and active research at the Royal Institute of Science. Please see Royal Society of Science, *Nature*, 142 (1938), 786.

[65] The Second Report of the Royal Institute of Science for 1926-34, noted that in light of the fact that in that period, the total number of papers was 128 and the number of approved M.Sc. theses, it would, in order to 'make further progress in the same direction it would be necessary. . . (1) gradually to discontinue the undergraduate teaching which takes up at present 50 per cent (2) to create a number of bursaries so that the holder may become self-supporting and work after taking the M.Sc. degree for the Ph.D. and D.Sc. degrees of the Bombay University.' Please see 'Report of the Royal Institute of Science 1926–34', *The Journal of the University of Bombay*, 4 (1935), 237.

[66] Aparajith Ramnath, *The Birth of an Indian Profession: Engineers, Industry, and the State, 1900-47* (New Delhi, 2017), 30.

[67] Ibid, 51.

professional meetings and discussions'.[68] Only a year later (1921), the private enterprise TISCO (Tata Iron and Steel Company Limited) would establish an in-house training centre for its native employees, the Jamshedpur Training Institute.[69] The point of interest here is that the Royal Institute of Science was therefore a product of its time, where the tide was ineluctably turning towards the training of Indians in practical terms, and where it gradually became proper to consider that native minds were not merely capable, but well-equipped to conduct sustained research.

The Prince of Wales Museum

In 1904, a group of citizens of Bombay, such as Sir Pherozeshah Mehta, Justice Badrudin Tyabji, Narotamdas Gokuldas, Justice Chandavarkar, and Sassoon J. David, decided that the visit of the Prince of Wales to India would be celebrated with a public museum named in his honour. Accordingly, the following year, the foundation stone for the museum was laid by Edward Albert, the Prince of Wales, but it was only in 1923 that the museum building was officially opened by Lady Lloyd, wife of Sir George Lloyd, Governor of Bombay (1918–1923). Bombay was the only Presidency city not to have a large public museum, while the Indian Museum in Calcutta and the Government Museum in Madras were drawing large crowds.[70] A marker of modernity, the public museum was much desired, and while Bombay had the quintessential industrial arts museum in the form of the Victoria and Albert, a universal museum was lacking. In addition, there was a shortage of display and storage space in the city to accommodate the works of art at the J. J. School of Art and also the rapidly increasing number of antiquities and finds of the Western Circle of the Archaeological Survey of India.[71] Very early on, there was a suggestion put forth by Mr. H.M. Phipson, honorary secretary of the Bombay Natural History Society (BNHS), that the site should have three components, a Museum of Art and Archaeology, a Public Library, and a Natural Science Museum – he made these recommendations in his capacity as a member of the museum committee in 1906.[72] In accordance with such a plan, the burgeoning collections of the BNHS were transferred to the new Prince of Wales Museum, an example of the efforts of individuals involved

[68] Ibid, 72. [69] Ibid, 204.

[70] Tapati Guha-Thakurta, *Monuments, Objects, Histories: Institutions of Art in Colonial and Post-colonial India* (Ranikhet, 2004), 80.

[71] S.F. Markham and H. Hargreaves, *The Museums of India* (London, 1936), 111.

[72] *The Bombay Natural History Society, 1883-1933*: Printed in *Commemoration of the Golden Jubilee of the Society, 1933* (Bombay, 1934), 10-11.

in two or more institutions. But several other collections and bequests changed the nature of the museum completely. The building was partially funded by Sir Jacob Sassoon and Sir Ibrahim Currimbhoy. Artefacts were also transferred from other institutions such as the defunct Poona Museum, the Royal Asiatic Society and the Anthropological Society.[73] Sir Dorabji Tata and Sir Ratanji Tata along with several other patrons donated their entire art collections. Very soon, the Prince of Wales Museum became the centre of a number of educational programmes and publishing activities. The illustrious curators of the museum included a mix of British and Indian scholars, well in keeping with the pattern that was common in India after World War I. Despite changes in name, the museum remains one of the few places in the region where original scholarship on art and the history of art continues. The collections serve at least a dual purpose, to educate the masses and as an archive and repository for scholars.

Imbricated Institutions

Many of the institutions described above shared personnel and other resources, in many cases one being born out of the other. Three examples of such intertwined institutional histories illuminate this point. Perhaps the single most important contributor to zoological and geological aspects in the *Journal of the Bombay Branch of the Royal Asiatic Society* was Henry John Carter, Assistant Surgeon in the Medical Service, Bombay Establishment, who was responsible for the first original paper in zoology of some significance in the *Journal*: 'Observations on the Sindh Musquitoe'; four years later, an article that he penned on the freshwater sponges of Bombay would appear in its pages as well.[74] The author of *Geology of the Island of Bombay* (1852), *Summary of the Geology of India* (1854), and *Geological Papers on Western India* (1857), he would eventually receive the Royal Medal of the Royal Society in 1872.[75]

Although there was little elucidation of habit, classification or physiology by 'native' Indians in local scientific journals during most of the 19th century, there was at least in Bombay the supply for their dispensation through the financial support of Mr. Juggurnauth Sunkersett [Murkute].

[73] S.F. Markham and H. Hargreaves, *The Museums of India* (London, 1936), 111.

[74] H.J. Carter, 'Observations on the Sindh Musquitoe, By H.J. Carter', *Journal of the Bombay Branch of the Royal Asiatic Society*, 1/7 (1844), 430-4. Described by the author as the same species as the 'sandfly' as named by the Europeans, a taxonomic description was provided, along with diagrams. H.J. Carter, 'A Descriptive Account of the Fresh-water Sponges in the Island of Bombay, with observations on their Structure and Development', *Journal of the Bombay Branch of the Royal Asiatic Society*, 3.1/12 (1848), 29-50.

[75] D.G. Crawford, *History of the Indian Medical Service* (London, 1914), 148.

Seven years later, Sunkersett's financial contribution to the cause of natural history was made known in a eulogy.

> Mr Sunkersett's connexion with this Asiatic Society had existed for twenty years,…he was the third native gentleman who entered it. Though he had not directly contributed to its researches (and this was not expected of him)…he had greatly enlarged its library in an important and attractive department, that of Natural History, by his presentation to it of five thousand rupees, which had enabled the Society to purchase the beautiful volumes (bearing his name) now exposed to view in the Society's rooms.[76]

It is interesting that the records of native input at the time related to purely pecuniary matters. The sentiment enshrined in the passage above is revealing—the fact that even the third native gentleman who had entered the society was not expected to contribute to the researches themselves. Ray Desmond draws attention to this fact relating to Indian academic scholarship contending that it was the 'paucity of educational facilities and colonial proscriptions that deprived students of the advantages of western culture, especially in science and technology', while he attempts a partial refutation by suggesting that 'although the criticism is not without substance, there were enlightened Europeans who promoted the cause of Indian education.[77] If such enlightenment, however, did not extend to the expectation of actual research, the question must perforce be begged. Lieutenant Colonel K. R. Kirtikar (1849–1917), surgeon in the Indian Medical Service and distinguished botanist, would himself read a paper on the *Progress of Natural History over the Last Century* in 1905 to the Bombay Branch of the Asiatic Society. The sensibility inhering in Kirtikar's narrative was clear. There was a decided vector of knowledge transfer and it was European. The response was to be, in his view, just as obvious—fawning gratitude. It was precisely such a perspective that would mark the conduit of the negotiation of knowledge on natural history at this juncture. Such a conduit that would inflect the training of an increasing number of Indians in the field through the development of the Zoological Survey of India, *The Fauna of British India* series and of the oldest and still extant organisation devoted to the subject that occurs in its eponymous title, The *Bombay Natural History Society*.

Another thread that tied institutions together related to the sharing of office-bearers. For example, Sir George Birdwood was simultaneously the Secretary and Curator of the Government Central Museum, the Secretary

[76] Anonymous, 'Appendix: Eulogy to the Honorable Juggernauth Sunkersett', *Journal of the Bombay Branch of the Royal Asiatic Society,* 8/24 (1872), lxxix–lxxxiii.

[77] Ray Desmond, *The European Discovery of the Indian Flora* (Oxford and London, 1992), 188.

of the Agricultural and Horticultural Society of Western India, the Honorary Secretary of the Bombay Branch of the Royal Asiatic Society, the Sheriff of Bombay, and the Registrar of the University of Bombay, in the 1860s. Crucially, he was an early advocate for the training of Indians so as to fit them for positions of authority in administrative service.

The extraordinary circumstances in Bombay where the University did not engage in research, nor even teaching (this was delegated to pre-existing colleges) in the first fifty years of its existence, lent unique significance to independent and subscription-based societies and institutions in the production of knowledge. The enterprising and remarkable personalities who shaped several of these institutions in an imbricated manner comprised Europeans and Indians, the latter rising in numbers in the first half of the twentieth century. Bombay itself, already the mercantile capital of India as a consequence of both the Second Opium War (1856–60) and the U.S. Civil War (1861–65), became increasingly connected with a larger world in which men of letters and technology circulated freely. While there remained a strong British presence, it must be noted that several other Western presences found themselves in Bombay, such as Mark Twain and the Fisk Jubilee Singers from the U.S.A. The city also became the site of early adoption of technological advancement, particularly ship-building and elements of mass media: photography, printing and cinema. Thus, Bombay established itself as a crucial node in the story of networks of international knowledge systems.

Contrasting Characters

We examine here the lives of two pioneering scientists in India, educated in different centuries. One was of English extraction, born in India, educated in England, only to return to India for much of his working life. The other was Indian, educated in both India and England, and worked in India for the rest of his life. Their training across continents did not prevent either of them from being larger-than-life individuals in their respective areas of influence. Their interests encompassed much wider domains than those of their formal training. Although owing to a statement he made towards the end of his life that plunged him into notoriety and has afforded him a reputation of an arch colonial figure, Sir George Birdwood was deeply rooted in the culture of the Indian subcontinent.[78] Homi Bhabha,

[78] At a meeting where Sir George Birdwood was chairing the proceedings of the Indian Section of the Royal Society of Arts, on the 13th of January, 1910, he stated that in all of his experience of seventy-eight years, he was yet to find an example of fine art in India. In relation to a photograph drawn to his attention of an image of the Buddha, he declared, 'This senseless similitude, in its immemorial fixed pose, is nothing more than an uninspired

by contrast, had an upbringing, education and access that were essentially European, even if situated in India. His family had the resources so that he was trained at the best of institutions. The paradox could not be starker!

Sir George Birdwood

Polymath and translocate,[79] Sir George Birdwood was born in Belgaum in 1832.[80] His father retired as a general in India in 1877, having served for 52 years, of which 45 were in India. At seven, he was sent to England to study at the New Grammar School, and eventually to the University of Edinburgh, where he became a physician in 1854.[81] He returned to India a year later, and established himself not only in medical and military circles, but also in the cultural affairs of Bombay. As noted earlier, he served several institutions at the same time, shaping new fields and conducting original research. Birdwood presented the results of his investigations in learned societies in whose development he had a seminal role to play. He was fierce in his advocacy of admitting Indian scholars and researchers, many of whom he mentored, to these bodies.

Homi Bhabha

Lionised as the father of the Indian nuclear programme, Homi Bhabha grew up in an affluent Parsi family in Bombay.[82] He attended the Cathedral and John Connon School where his love of science was fostered, as he himself wrote in a letter to C. H. Hammond, the former Headmaster of

brazen image, vacuously squinting down its nose to its thumbs, and knees, and toes. A boiled suet pudding would serve equally well as a symbol of passionless purity and serenity of soul!' See George Birdwood, *Journal of the Royal Society of Arts*, 58 (1910), 287.

[79] One of us (Mathew) has denominated the 'translocate', as a European expatriate whose working life was in major part or wholly devoted to work in the colonial world (in this case, India) Mathew adopts the term 'translocate', if in somewhat modified form, from classical cytogenetics, where during crossover in the first meiotic phase of reproductive cell division there is exchange of chromosomal material in a process known as translocation. The result is an altered chromosome, possessed of a significantly different character from its original form. See John Mathew, 'To Fashion a Fauna for British India', PhD thesis, Harvard University, 2011. The translocate is a subset of the expatriate, but assumes an inflection of specialization, where his or her action is actively directed towards the accrual of information and where he/she mediates the flow of knowledge between systems that at first glance may appear to be incommensurable.

[80] Luois Mallet, 'Sir George C.M. Birdwood: His Life and Work', in *Journal of Indian Art and Industry*, 8 (1900) 45-7.

[81] Gupchuk, *Sir George Birdwood*, 2.

[82] B.S. Kademani, *Scientometric Portrait of Homi Jehangir Bhabha: The Father of Indian Nuclear Research Programme* (Mumbai, 2009).

the school.[83] His father's sister was married to Dorabji Tata, son of the pioneer industrialist Jamsetjee Tata, and it was at their house where he spent a considerable amount of his childhood that he saw the alliance between industrialists and nationalist politicians being forged.[84] He passed his Senior Cambridge exam before he was sixteen, in 1924, and thus was ineligible for any college abroad; he therefore enrolled in Elphinstone College and then later simultaneously at the Royal Institute of Science in Bombay. The American physicist Arthur Holly Compton gave a speech at the Institute in 1926 (the year before he won the Nobel Prize), introducing the young Bhabha to cosmic rays.[85] The very next year, Bhabha left for Cambridge and embarked on his illustrious career.[86] The importance of that one year at the Royal Institute of Science for Bhabha is best described in his own words: 'The fine location of the Royal Institute of Science, its handsome building and the enthusiasm of some of the members of the staff made it a real pleasure to work there. The one year I spent studying there before I left for Cambridge was a very happy one. I remember that it was in the main lecture hall that I first heard of cosmic rays, the subject which was later to become my own special field of study.'[87]

[83] Spenta R. Wadia, 'Homi Jehangir Bhabha and the Tata Institute of Fundamental Research' in *Homi Jehangir Bhabha on Indian Science and the Atomic Energy Programme: A Selection* (Mumbai, 2009), 10-24, esp. 11.

[84] Indira Chowdhury and Ananya Dasgupta, *A Masterful Spirit: Homi Bhabha* (New Delhi, 2010), 20.

[85] Ibid, 23.

[86] At Cambridge, by studying for the Tripos of Mechanical Sciences and that of Mathematics, he was thoroughly brought up to date with questions in applied and theoretical mathematics. Under Paul Dirac's direct supervision and working with the eminent physics at Cambridge's Cavendish Laboratory who were at the forefront of bringing latest findings in theoretical physics to terms with experimental realities, Bhabha was steeped in the cutting-age experimental nuclear physics at the time. For this doctoral and post-doctoral work, he was also able, on the Isaac Newton studentship from Cambridge, to collaborate with the leading theoretical and experimental quantum physicists outside Britain, such as Pauli in Zürich, Fermi in Rome, and Bohr in Copenhagen. 'Having secured first-class marks in engineering in 1930, Bhabha began learning theoretical physics just at the time when Cockcroft, Walton, Blackett, Occhialini, and Chadwick were doing important work on the structure of the nucleus in the Cavendish Laboratory. Bhabha published his first physics paper in German in October 1933 in *Zeitschrift für Physik* at age twenty-four. The following year he was elected to the Isaac Newton studentship that enabled him to remain at Cambridge for the next three years, complete his PhD under the supervision of R. H. Fowler, and travel in Europe. During this time, he visited the groups of Pauli in Zurich, Kramers in Utrecht, and Fermi in Rome, then centres for both theorists and experimenters. He also worked in the extremely active institute at Copenhagen that housed Niels Bohr's group'; see Robert Anderson, *Nucleus and Nation: Scientists, International Networks, and Power in India* (Chicago, 2010), 99.

[87] Chowdhury and Dasgupta, *A Masterful Spirit*, 24, reproduces the text of the 'Note on Royal Institute, 12 September 1945'.

Bhabha would come back to India at the beginning of World War II, and by 1945, set up the Tata Institute for Fundamental Research (TIFR). Initially in Bangalore, it moved to Bombay within six months, and fulfilled his desire to establish 'a vigorous school of research in fundamental physics'.[88] The site of the institute was in proximity to the University of Bombay, in order that there would be collaboration with the latter, but that was not to be.[89] In keeping with the university's past of not being involved directly with research, just like his alma mater the Royal Institute of Science, his creation TIFR would also not be imbricated within the university curriculum and structures.

Conclusion

A brief account of the institutional histories of centres of higher learning in Bombay charts a trend of increasing interest in scientific and technological research through the 19th and early 20th centuries. The University of Bombay, unlike its most other peers around the world, was not the locus of original research, nor the production of knowledge, being content with serving administrative functions. The onus of technical apprenticeship and the cultivation of wider interests, therefore, fell to the quasi-academic institutions that have been enumerated here. These institutions produced and were serviced by a cadre of dedicated and self-motivated individuals who took it upon themselves to nurture a spirit of original thought. As access to education and technical training became increasingly Indianized through the first half of the 20th century, it was initially an elite native element that benefited. The University was still, for the most part, curiously absent.

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[88] Wadia, 'Homi Jehangir Bhabha', 14-15. [89] Ibid, 16.