

Science for Freedom

Exploring Scientists' Role in the Freedom Struggle

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ABSTRACT

The paper traces the rise of scientific communities in response to colonial oppression from the second half of the eighteenth-century until India's independence in 1947. We study how scientific temper, held in colonial captivity (Krishna, 1991, p. 89), registered a break from colonial restrictions to find its moorings in the freedom struggle. There were scientists, but no meaningful science was allowed to happen by the British government. We learn from the existing literature how discriminatory practices disillusioned the native Indian scientists, which led to their parting ways with the British government and forming their own scientific community for conducting scientific research (Chakrabarti, 2009, 1996, pp. 188-195) (Krishna, 1991, pp. 89-95).

Even in the absence of government support, our scientists established informal collaborative networks to carry out and share scientific knowledge amongst them. Thus, scientists' successful formation of the scientific community in India marks the beginning of the real scientific endeavour. A galaxy of early scientists such as M.L. Sircar, P.C. Ray, J.C. Bose, C.V. Raman, M.N. Saha and Ashutosh Mukherjee started scientific investigation in pre-independence India.

The paper sheds light on the contribution of the above scientists to the cause of science in India and argues that the birth of science in the form of an organised scientific community was occasioned by the British government's opposition to free scientific endeavour. The Indian scientists earned the displeasure of the British government because they worked for establishing science to create universal knowledge, not as a handmaiden to the Empire (Krishna, 1991, p. 91). Thus, the paper concludes that the struggle for freedom already began in the mind of the scientific community in India against discriminatory colonial practises in scientific institutions quite early. The article mentions specific

historical events and draws inferences to form a theoretical framework for understanding the motives behind such historical happenings and their effects.

Keywords: Freedom struggle, Science, Pre-independence India, Indian Scientists.

Introduction

The British colonisation of India was as much a territorial occupation as it was a cultural and ideological project. There is little doubt that the British Empire was underpinned by science in several ways; science in terms of naval knowhow paved the way for overseas travel to reach far off territories; and the scientific “base”¹ helped the Empire to weave an ideological “superstructure” for legitimising cultural and ethnic superiority over the natives. Thus, science was at the root of British imperialism. Rajesh Kochhar notes,

Modern science gave Europe the physical means of subjugating and colonising the rest of the world and in the case of the old world the ideological justification for the exercise: any culture that could develop the powerful knowledge system of modern science was culturally and racially superior and therefore entitled to rule. (1999, p. 596).

Dhruv Raina identifies three broad phases in the development of science in the pre-independence period. First, during the period between the late eighteenth and early nineteenth centuries, Geological Survey and the Trigonometrical Survey were undertaken. Second, in the late nineteenth century, the Asiatic Society of Bengal, the Indian Association for the Cultivation of Sciences and the National Institute of Sciences (today known as the Indian National Science Academy) were established. This period saw the consolidation of British rule in India, after the First Indian War of Independence of 1857. The third was the passing of the University Charter Act in 1904 which paved the way for post-graduate teaching and research

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in universities for the first time. Before the University Charter Act, Indian universities awarded degrees, but no research was conducted (Raina, 2004, pp. 183-84).

There is little doubt that the coloniser opposes any organised intellectual activity amongst the colonised – rather, it educates some to create divisions. And, the British rule in our country was primarily based on technological and organisational superiority. Since India was a large country, the British realised that it was essential to have a cadre of well-trained Indians in administrative services including science and technology. So, they decided to assimilate some Indians through European education to provide staff for India's expanding organisational network (Potter, 1973, pp. 47-73). C. Potter postulates that along with the Indian nationalist movement, the shortage of manpower had been a decisive factor forcing the British government to withdraw from India (1975, p. 48). They, however, made a last-ditch attempt to reinforce their weakening organisation structure with the Indian officers educated in the British educational institutions. The British government launched an ambitious education revamp to groom officer cadre from the Indian masses to support their organisational establishment in India. Therefore, the British established a small number of universities loosely based on the British pattern in the nineteenth century (Mallick, 2006, p. 1138).

It is, nevertheless, pertinent to note that the shortage of workforce always constrained British colonial operations in India. The East Indian Company had formed its first permanent native infantry as early as 1757, consisting of Indian soldiers who had received European military training (Reid, 2012, p. 17). Moreover, there has always been a sizable presence of (em)ployable natives in the workforce of the East Indian Company. The approach of the two World Wars led to a severe work for cecrunch in the Raj that, along with the nationalist movement at its full force, played a decisive role to free India from colonial clutches. Moreover, it would be interesting to speculate that the British did not want to depart without leaving a "cultural legacy" in India in the form of universities and educational institutes. That British colonial project in India aimed to keep Indian men at the lower levels is apparent. It can

be argued that grooming Indian officers to work in the second-rung order under the British officers signified a shift in their strategy.

Between the later parts of the nineteenth century to the first quarter of the twentieth century, a class of Indians became eager to learn European science. Even the British government seemed to facilitate the introduction of European education in the educational institutes. To quote Kochhar, “Paradoxical as it may seem, inherent in the British rule over India was the slow and increasingly reluctant preparation of the Indians to eventually overthrow the British rule” (Kochhar, 1999, p. 597). The institutionalisation of modern or Western science in India began with the Great Surveys — the Geological, the Botanical and the Trigonometric Survey — under the inspired impetus of the Asiatic Society of Bengal, inaugurated in 1784. This was followed by establishing universities in the port towns of Bombay, Calcutta and Madras in 1857. Frederic J. Mouat lists the progress of education in India as under.

- 1 The establishment of the Hindu College of Calcutta in 1816
- 2 Lord Macaulay’s minute and the official adoption of the English language as the basis of public instruction, by Lord William Bentinck, in 1835
- 3 The establishment of the Medical College of Calcutta in 1835
- 4 Lord Hardinge’s educational resolution of October 10th, 1844
- 5 The proposal to set up a University in Calcutta
- 6 6. The remodelling of the Mahommedan and Hindu Colleges of Calcutta, and the creation of the Presidency College of Bengal in 1853
- 7 The Educational Dispatch of 1854

David Hare was given the responsibility to establish a school for offering scholarship-based education to bright Indian students – Mahendralal Sircar was the product of Hare School. To quote Kochhar, “Paradoxical as it may seem, inherent in the British rule over India was the slow and increasingly reluctant preparation of the Indians to eventually overthrow the British rule” (Kochhar, 1999, p. 597). What seemed paradoxical to Kochhar can be rationally explained; the British government

stood in need of Indians who could work as second-rate officers under the British officers. Therefore, they saw an opportunity in the proposal in December 1823 by Rammohun Roy to replace the *Sanskrit* system of education with the British system of education. To quote, "...the education policy of India [as] worked out by Macaulay...entirely aimed at colonial British (sic) requirements. The policy was directed at producing native administrators and bureaucrats of lower order to aid in the local administration" (Sen & Bhattacharya, 1991, p 67), who would obviously be loyal and help control any possible rebellion against the British government (Mouat *et al.* 1888, p.485).

However, this initiative at acculturation² and assimilation of Indians through English education proved counterproductive. Many early scientists such as M.L. Sircar, P.C. Ray, J.C. Bose, C.V. Raman, M.N. Saha and Ashutosh Mukherjee who had received primary education at the British-aided institutions, spearheaded "protest" against discriminatory policies followed by the British government. In the hands of these early Indians, imperial science ceased to be the colonial hegemonic tool but became a powerful instrument to challenge the Empire. Like Indian freedom fighters who fought the aggressor with the aggressor's weapons, the early Indian scientists challenged the Empire with scientific knowledge they had acquired from the university education in Britain. Such Indian scientists may be called "the scientific soldiers" who went to the British universities to acquire advanced scientific expertise that they utilised against the Empire.

On their return to India, they questioned the imperial bias against the Indian scientists in institutions such as Indian Medical Services and so on. Thus, they fought the Empire with their own weapon, i.e. advanced scientific knowledge. We can argue that our scientists were able to conquer imperial science before India won independence. Deepak Kumar argues that science formed the "domain of contestation and assertion of nationalism" against the colonial regime, and in the process of rising nationalism, science itself was "re-defined and re-located" (Kumar qtd. in Chakraborty, 2001, p.246). Therefore, the battle to secure freedom was fought at many a front – the intellectual area was the most crucial. Zaheer Baber also notes the dialectic relationship between colonialism and science:

The relationship among science, technology, and colonialism is complex and multifaceted; any one-side study of it might lead to misunderstanding due to oversimplification. Science and technology did indeed contribute to colonial expansion and the legitimation of power, but colonial rule itself led to the creation of new forms of knowledge and institutions.... (Baber, 1996, p.10).

Life and Contribution of Mahendra Lal Sircar (1833-1904)

Dr Mahendra Lal Sircar was born in November 1833, in Paikpara, a village in Calcutta. After completing his education at the David Hare School and the Hindu College, Sircar joined Calcutta Medical College. He received an MD degree in 1863. To quote,

He had an extraordinarily chequered career in the Medical College. He carried off medals, prizes and scholarships in Botany, Physiology, Medicine, Surgery and Midwifery. He possessed such a keen intellect that he was sometimes ahead of some of his Professors in information in their own specialities. For instance, it is related of him that he lost his gold medal in Medical Jurisprudence for having stated in an answer to a question that the lethal dose of arsenic was much larger than stated in books and that men were known who had accustomed themselves to taking it without injury in doses of more than a drachm. (Ghose, 1909, p. 5)

Sircar was one of the prominent allopathic physicians in the country when he developed a profound interest in homoeopathic medicine. He wrote extensively about homoeopathic remedies in the *Calcutta Journal of Medicine* (Ghose, 1909, p. 10).

Sircar also founded the Indian Association for the Cultivation of Science (IACS) on 15 January 1876. IACS was the first Indian institution in pre-independence India devoted to the research and dissemination of science (Lourdusamy, 2003, p.381). Sircar had been voicing the need for a national science association since 1869 in the *Calcutta Journal of Medicine*, pamphlets and public addresses (Sircar, 1869, pp. 1-45). It started with a course of lectures by Sircar, Lafont, J. C. Bose and Asutosh Mukherjee; the lectures were later published by the

Asiatic Society. The lectures were published in the newspapers such as the *Hindu Patriot*, the *Indian Mirror* and the *Bengalee* (Sircar qtd. in Visvanathan, 1985, p. 20). By establishing IACS, Sircar had laid down a firm foundation for pursuing scientific endeavours in pre-independence India by scientists such as J.C. Bose (1858-1937), P.C. Ray (1861-1944), C.V. Raman (1888-1970) and M.N. Saha (1893-1956). Sircar envisioned IACS to encourage research and dissemination of science amongst the masses. To quote Chakraborty, “The IACS was the first attempt at an institutional articulation of the relationship between nationalism and scientific research in colonial India. It encouraged Indians to engage in fundamental research in science and to develop their own hypotheses and arguments, thereby establishing themselves as citizens of a modern scientific nation” (2001, p. 247).

That Eurocentric science underwent social and cultural reorientation in the process of nationalism has been pointed out by scholars such as Deepak Kumar, Dhruv Raina and S. Irfan Habib.³For Sircar science, if freed from colonialism, could offer firm ground to further the nationalist agenda; if science could become the guiding angel, political and social mobilisation could happen seamlessly. Sircar, who obviously knew how science had ushered in an era of enlightenment after the dark ages in Europe, wished for a similar scientific renaissance in India. Thus, Sircar’s idea of science (though allied with nationalism) transcends the necessity of securing national freedom to ensure nation-building afterwards. Mahendra Lal Sircar was a freedom fighter in the mould of a scientist in addition to being a social reformer, a practising doctor, a prolific writer, a columnist and a popular public speaker. The sheer vision, commitment and unique set of talents make Sircar’s contribution to the freedom movement unparalleled. The current historiographical accounts on the role of science and scientists in the national freedom movement are confined to the political agitations and the acts of *Satyagraha* by a few political leaders of the times. This paper, thus, endeavours to bring to light many a lost chapter of the Indian freedom struggle, without undermining the contribution of the leading figures such as Rammohun Roy, Sir Syed Ahmad Khan and M.K. Gandhi in the political and social arenas of the freedom movement.

Medical Science: The Early Signs of Resentment

Medical science saw early signs of confrontation between the British and the nationalists because medical science was directly connected with the social welfare of the people. The rise of nationalism demanded the democratisation of scientific and medical education and research. The strife occurred around the issues of discriminatory culture and the general welfare (Chakrabarti, 2009, p. 189). In colonial India, medical research and practice were under the hegemonic control of the Empire (Krishna, 1991, p. 89). From the 1900s, the British domination of the Indian Medical Services was challenged by emerging Indian nationalism. The Indian nationalists, including the doctors and the scientists, were gaining strength from the issues of public health and social welfare. They wanted to decouple Indian Medical Services from colonial control in order to construct new national identities (Chakrabarti, 2009, p. 188).

Since the mid-eighteenth century, the British had been exercising complete control over the domain of medical sciences in India. The institution of the Indian Medical Services was the hub of British domination. The Indian Medical Services were populated by medical personnel from the English East India Company. As a result, the doctors hailing from the British military services were employed in civil hospitals and dispensaries all over India. To quote Chakrabarti, “This dual role of the IMS, in the military and civilian health care, was unique and crucial to its survival and influence” (2009, p.191). So much so that the entrance exams for recruitment of doctors were held in England only and the passing out doctors had their training at British institutions. The state of medical education and research in Indian universities was in shambles, and until the turn of the twentieth century, the number of successful Indian doctors joining the medical profession was negligible. The reason behind such a sorry state of medical education in India was the lack of government investment in medical infrastructure (Chakrabarti 191).

Adding to the British government’s woes was mounting pressure from medical faculties and students of Indian universities to provide facilities of clinical study and research for Indian doctors and students. In their distrust of Indian Medical

Services, they had formed groups outside the purviews of Indian Medical Services to press for their demands. The British doctors at the Indian Medical Services, on the other hand, became anxious about losing their monopoly over IMS affairs. To quote Chakrabarti,

The nationalist movement, which was growing in popularity, was challenging the authority of the colonial state to represent public concern and welfare as part of its struggle for state power. Thus, in India, the question of science and national identity had become a political one (2009, p.190).

Pratik Chakrabarti makes a crucial point when he says that the early rumblings of freedom struggle were beginning to be felt in the strife between the nationalists and the British government with respect to medical education and research in India. To quote,

The university-government divide in medical research holds a key to the history of medicine in India, as well as to the history of Indian nationalism. University education and teaching had been the mainstays for the emergent Indian middle class, and universities had historically been an important site for Indian intellectuals, for their political struggles. The first generation of Indian scientists who became prominent at the turn of the twentieth century were all products of the Indian universities (Chakrabarti, 2009, p. 190).

Krishna also notes that a section of Indian scientists associated with colonial scientific organisations resorted to struggling against racial discrimination by the colonial government.... Towards the turn of the century, the demand for “scientific autonomy” was becoming articulate in the emerging Indian national consciousness. A section of the scientific intelligentsia set the agenda for resisting colonial science, and for creating alternative structures, with in the framework of nationalism to re-define science from the Indian nationalist perspectives. These voices of dissent from the scientific communities were being resonated by the forces of nationalism at large (Krishna, 1991, pp. 89-95).

The Indian scientists were able to cross the divide between the colonisers and the colonised by virtue of their personal and

professional terms, which enabled them to draw benefits from the knowledge corpus of European science. The introduction of Western science and technology in India constituted one such process facilitated partly by the “active involvement of scientists in creating a transnational culture, developing common communication strategies and, at the same, erasing cultural differences” (Baber, 1996, p.9). Scientific communities understood that differences aside, the attempt at the globalisation of scientific and technological institutions could create new patterns of scientific knowledge.

Prominent Scientists and their Contribution

J.C. Bose (1858-1937) obtained his B.A. from St Xavier's College, Calcutta. He went to Cambridge in 1878, and worked under such prominent scientists as Rayleigh and Francis Darwin. After earning a degree from the University of Cambridge (1884), Bose served as a professor of physical science at Presidency College, Calcutta. Bose founded the Bose Research Institute in Calcutta.⁴ Bose's appointment met with objections from the British government. Bose was only allowed to accept the professorship if he waived his claim to full salary and accepted two-thirds of it. He protested quietly, by refusing to receive his monthly pay.

Bose's science was inspired by the Indian Vedic thought for developing an understanding of the physical world around us. Bose's view of nature was spiritual, and he regarded life on earth with an even eye. Bose's research aimed to authenticate India's traditional corpus knowledge to synthesise various branches of knowledge. While doing so, Bose contested the Western ideas of nature as external reality and knowledge consisting of separate disciplines of specialisations. Moreover, Bose assigned Sanskrit names to his instruments to propagate the Sanskrit thought language. He established a research centre in 1917 named Bose Research Institute to provide research opportunities to the coming generation of Indian researchers.

Since Bose was a nationalist besides being a scientist, he practised science as an instrument of nationalism. He was quite articulate against the colonial policy of discrimination against

Indian scientists, and sheer disregard for advanced research in the country. To protest against discrimination in the appointment and pay scale, Bose did not accept any salary for three years. He took time from his laboratory to motivate Indian youth to work hard for the country. As a nominated member of the League of Nations Committee on Intellectual Cooperation, Bose met with the leading intellectuals of the times and Nobel laureates like H.A. Lorentz and Albert Einstein. He used such opportunities to champion the cause of freedom and enlightenment with science (Sinha, 2015, pp. 193-194).

Like Bose, P.C. Ray also faced discrimination in employment. He could not find a job for a year due to discrimination against Indian scientists. After securing the Hope Prize fellowship and a DSc from Edinburgh, P.C. Ray returned to India in 1888. He applied to the Bengal educational department. Like the civil service, the Educational Service had a two-tiered parallel structure. The imperial levels of the service were meant for the English, and Indian scientists were only allowed two-thirds of the salary given to English Professors.

The achievements of Bose and Ray had an enormous impact on the nationalists of the time. From 1885 to 1889, working in a small laboratory with only a tinsmith as a mechanic, Bose initiated researches on Hertzian waves. His first paper, "The Polarization of an Electric Ray by a Crystal," was read at the Asiatic Society. Bose's work received recognition slowly. The western world gradually admitted the value of work by an Indian scientist. In 1900, Bose presented a paper at the International Congress of Physics arguing that a thin line existed between the physical and the physiological realms. The pioneering work of Bose was applauded by the scientific communities in Britain, France and Vienna. The achievements of Bose and Ray inspired the nationalist movement to counter the Empire's doubt that India was not mature enough to govern itself (Chatterton qtd. in Visvanathan, 1985, p. 44). Bose's work on plant response was in fact, described by the *Prabasi* as the excellent *Swadeshi* event of 1906. The achievements of Bose and Ray and the discrimination of the educational system awakened the Indian masses, and the Indian National Congress passed a motion to protest against such hindrances in 1896 (Sinha, 2015, pp. 193-194).

The IACS funded and supported basic research for several Indian scientists, and an entire school of Indian physicists was trained at its Cultivation of Science Laboratory. Fifty years later, Sircar's IACS laboratory became the venue for Chandrasekhara Venkata Raman's (1888-1970) Nobel prize-winning experiments. Sircar's understanding that the Indian scientists would not thrive under the colonial system of education was vindicated when C.V. Raman, one of the students of the IACS who was expected to be "the brightest ornament of the Association," became the first Asian scientist to win the Nobel Prize for theoretical physics in 1930 for the discovery of the "Raman effect." The IACS was eventually affiliated with the newly created physics and chemistry departments of Calcutta University, and Sircar's goal of combining scientific research and teaching was realised with the creation of the University College of Science in Calcutta in 1916. The University College provided an institutional platform for the leading Indian scientists, who were active participants in the final debates before independence, about the role of modern science and technology in Indian society. These ideas generated in such debates substantially influenced the direction of science and technology in India after independence (Baber, 1996, p. 230). C.V. Raman had voiced his political opinions several times; for him, national freedom must accompany national awakening. He had once said, to quote,

National awakening has got other fields than politics in which it can show itself...I think scientific endeavour has certainly a national value, and I have heard it said that what Indian scientists, particularly physicists have done, has helped more to raise the estimation of India in the world than recent political events. (Rajinder, 2019, p. 316)

Moreover, notes Rajinder, C.V. Raman was not a supporter of Gandhi's political ideologies. For instance, during WWII, a newspaper reported Raman saying, "force can be vanquished only by a greater force. — Raman pooh-poohed Mahatma Gandhi's theory on non-violence." (Rajinder, 2019, p. 316).

Conclusion

Thus, we can conclude that the shortage of doctors and scientists led the British to impart higher education to Indians. The educated Indians, instead of being intellectual slaves of the empire, used their learning to challenge the empire. M.L. Sircar, who had received education at the British institutions, has been the role model for a generation of scientists and doctors who fought for independence. M.L. Sircar was a freedom fighter in the mould of a scientist in addition to being a social reformer, a practising doctor, a prolific writer, a columnist and a popular public speaker. The sheer vision, commitment and unique set of talents make Sircar's contribution to the freedom movement unparalleled.

Some of the Indian scientists collaborated on their personal terms with European doctors and scientists and received huge support for their national cause. They were able to cross the divide between the colonisers and the colonised by virtue of their personal and professional terms, which enabled them to draw benefits from the knowledge corpus of European science. The work by Bose, Ray and Raman earned India international acclaim and proved that India can prosper better if granted freedom. Thus, the Indian scientists fought a battle on the intellectual battleground – no less fierce than the revolutionaries and pre-eminent politicians and social reformers of the times did. While the farmers, soldiers, *sanyasis* and commoners fought for physical, social, economic and spiritual independence, the scientists of India battled for liberating the mind. That no existing historiographical research fully accounts for their invaluable contribution to the freedom movement even after the lapse of 70 years of independence, the need for their resurrection becomes a national atonement.

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Notes

- 1 The base and superstructure as propounded in the Marxist Theory
- 2 The process of adapting a new or different culture with more or less advanced patterns. See. "Acculturation," *Collins English Dictionary*, <https://www.collinsdictionary.com/dictionary/english/acculturation>, Accessed on 31-01-22 at 9.46 pm.
- 3 See. Chakraborty, P. (2001). "Science, Morality, and Nationalism: The Multifaceted Project of Mahendra Lal Sircar." *Studies in History*, 17(2), 245–274. <https://doi.org/10.1177/025764300101700204>, *SAGE Journals*, Accessed on 7-02-22 at 11.06 am. Also, see. Raina, D. (2006). Science since Independence. *India International Centre Quarterly*, 33(3/4), 182-195. *Google Scholar*, <https://www.jstor.org/stable/23006080>, Accessed on 08-02-2022 at 5.38 pm.
- 4 Jagadish Chandra Bose. The Editors of Encyclopaedia Britannica, n.d. *Encyclopedia Britannica*. <https://www.britannica.com/biography/Jagadish-Chandra-Bose>, Accessed on 10-02-2022 at 11.38 am.

References

- 1 Baber, Zaheer. (1996). *The Science of Empire: Scientific Knowledge, Civilisation and Colonial Rule in India*. State University of New York Press.
- 2 Chakrabarti, P. (2009). "Signs of the Times:" Medicine and Nationhood in British India. *Osiris*, 24(1), 188-211, *Google Scholar*, <https://www.journals.uchicago.edu/doi/abs/10.1086/605975>, Accessed on 01-02-2022 at 9.08 am.
- 3 Chakraborty, P. (2001). "Science, Morality, and Nationalism: The Multifaceted Project of Mahendra Lal Sircar." *Studies in History*, 17(2), 245–274. <https://doi.org/10.1177/025764300101700204>, *SAGE Journals*, Accessed on 7-02-22 at 11.06 am.
- 4 Ghose, Sarat Chandra(1909). *Life of Dr. Mahendra Lal Sircar*. The Oriental Publishing Home, Calcutta. Print.
- 5 Jaim, H. I., & Jaim, J. (2011). The Decisive Nature of the Indian War Rocket in the Anglo-Mysore Wars of the Eighteenth Century. *Arms & Armour*, 8(2), 131-138. *Google Scholar*, <https://www.tandfonline.com/doi/abs/10.1179/174962611X13097916223244>. Accessed on 9-02-22 at 10.26 am.
- 6 Kochhar, R. (1999). Science and Domination: India before and after Independence. *Current Science*, 76(4), 596-601, *Google Scholar*, <https://www.jstor.org/stable/24100769>, Accessed on 02-02-2022 at 4.28 pm.
- 7 Krishna, V. V. (1991). "The Emergence of the Indian Scientific Community." *Sociological Bulletin*, vol. 40, no. 1/2, Indian Sociological

- Society, pp. 89–107, <http://www.jstor.org/stable/23620019>, Accessed on 21/01/2022 at 10.11am.
- 8 Lourdusamy, J. B. (2003). The Indian Association for the Cultivation of Science: A Tortuous Tryst with Modern Science. *Journal of Science Education and Technology*, 12(4), 381–396. <http://www.jstor.org/stable/40188743>, JSTOR, Accessed on 08-02-2022 at 3.10 pm.
 - 9 Mallick, S. (2006). Democratising scientific knowledge through building scientific institutions in nineteenth century India: the sociology of science perspective. *Current Science*, 1138-1145.
 - 10 Mouat, F. J., Thornton, T. H., Yeats, J., & Donnelly, J. F. D. (1888). *Journal of the Society for Arts*, Vol. 36, no. 1844. *The Journal of the Society of Arts*, 36 (1844), 483–524. <http://www.jstor.org/stable/41335261>, JSTOR, Accessed on 4-02-22 at 2.46 pm.
 - 11 Potter, D. (1973). Manpower Shortage and the End of Colonialism The Case of the Indian Civil Service. *Modern Asian Studies*, 7(1), 47-73. doi:10.1017/S0026749X00004388, *Google Scholar*, Accessed on 05-02-2022 at 2.28 pm.
 - 12 Raina, D. and S. Irfan Habib (2004). *Domesticating Modern Science*. Tulika Book, New Delhi. *Google Scholar*, <http://ir.lucknowdigitallibrary.com:8080/xmlui/bitstream/handle/123456789/1232/11265.pdf?sequence=1>, Accessed on 03-02-2022 at 4.28 pm.
 - 13 Raina, D. (2006). Science since Independence. *India International Centre Quarterly*, 33(3/4), 182-195. *Google Scholar*, <https://www.jstor.org/stable/23006080>, Accessed on 08-02-2022 at 5.38 pm.
 - 14 Rajinder, Singh (2019). “Yes, C.V. Raman Wept - Booting Nationalism with Tears.” *Science and Culture*, 85,315, pp. 8-10, *Google Scholar*, <http://www.scienceandculture-isna.org/2019/sept-oct/04%20Rajinder%20Singh.pdf> Accessed on 8-02-22 at 6.56 pm.
 - 15 Reid, S. (2012). *Armies of the East India Company 1750–1850*. Bloomsbury Publishing, *Google Scholar*, <https://books.google.com/books?hl=en&lr=&id=N1y1CwAAQBAJ&oi=fnd&pg=PA1&dq=Armies+of+the+East+India+Company+by+Stuard+Reid&ots=U6w2atWtud&sig=QyhdEkz8nINrpDQBap42uVewcU4> , Accessed on 06-02-2022 at 2.55 pm.
 - 16 Sen, R., & Bhattacharya, D. K. (1991). Education in India. *Indian Anthropologist*, 21(2), 67–74. <http://www.jstor.org/stable/41919656>, *JSTOR*. Accessed on 06-02-2022 at 2.55 pm.
 - 17 Sinha, J. N. (2015). Science and the freedom movement. *Studies in People's History*, 2(2), 189-200. *Google Scholar*, <https://journals.sagepub.com/doi/abs/10.1177/2348448915600938>, Accessed on 10-02-2022 at 11.55 am.
 - 18 Sircar, M. L. (1869). *On the Desirability of a National Institution for the Cultivation of the Sciences by the Natives of India*. Anglo-Sanskrit Press. *INSA Digital Repository*, https://insa.nic.in/writereaddata/UploadedFiles/IJHS/Vol29_1_13_Supplement.pdf

<http://www.insa.ndl.iitkgp.ac.in/xmlui/handle/1234567/1448>, Accessed on 8-02-22 at 5.46 pm.

- 19 Visvanathan, S. (1985). *Organising for Science*. New Delhi: Oxford University Press. *Google Scholar*, <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.650.653&rep=rep1&type=pdf>, Accessed on 10-02-22 at 10.26 pm.