CHAPTER III

Science and Swadeshi: National Education and Universities, Self-Enterprise and Industrialism

The Swadeshi movement that had its genesis as a political movement was a protest to the Curzonian Partition of Bengal in the first decade of the twentieth century. The movement gradually transformed itself into an alternative spirit of self reliance based on indigenous production, education and inculcation of science.[258] In order to popularise the swadeshi or indigenous system of production, education in the mother tongue and science for skill based industrialism among the common masses of towns and muffasils, a few individuals took the initiative to set up amateur societies and industries. As a manifestation of the spirit of swadeshi, the publication of scientific magazines, journals, and related literature in regional or local languages euphemistically called the vernaculars, proliferated. This chapter documents instances of such individual and quasi institutional efforts in this direction. It underscores the proliferating publication of Hindi tracts on science, technology, and medicine. It examines the compilation of swadeshi directories and advertisements extolling and canvassing for new swadeshi products of everyday use and of crafts that produced compatible and affordable daily use commodities. The chapter also discusses and documents print culture in the vernacular by tapping songs and poems in the form of *bhajans* and *ghazals* by regional and local noted poets that vividly portray and invoke the spirit of swadeshi, science, craft and Indian industrialism in the first three decades of the twentieth century. It is in this context that we will revisit the idea and context of national education and

[258] Sumit Sarkar, *Swadeshi Movement in Bengal, 1903-08*, New Delhi: Peoples Publishing House, 1994; Amit Bhattacharya, *Swadeshi Enterprise in Bengal, 1900-1920*, Calcutta: INA Press, Mita Bhattacharya, 1986.

will also allude to some significant aspects of the inculcation of science within the framework of Indian universities.

The search for identity and strength as reflected in the discourse of science and in the aspiration and articulation of the scientists and cultural interlocutors constitutes the basic thrust of this chapter. Identity both in terms of culture and place and parity in the domain of science and strength in terms of self-reliance of the nation is documented to demonstrate how Swadeshi or self-reliance was debated among the scientists. The underpinnings of differing shades of Swadeshi and industrialism both at local, regional and national level also acts a template for the animated and contested discussions on the ideas of planning the nation from late 1930s onwards.

Individual Efforts and Engagement

In the first half of the twentieth century, the spirit of swadeshi was manifestly evident in the earnest efforts and engagements of individuals such as teachers and mentors associated with various amateur societies and institutions of higher learning. They made great efforts to render popular books and textbooks on science and mathematics in the vernacular for dissemination among Indian students and entrepreneurs. In this section, evidences of both translations and independent rendering of text books and popular books on science that went through several prints and reprints in the first half of the twentieth century have been highlighted by drawing upon the Hindi repertoire. The same spirit of swadeshi was manifested in Bangla in which similar efforts were initiated much earlier, and by the early decades of the twentieth century, had obtained maturity.[259] Among popularisers of science and swadeshi in Hindi were hitherto unknown individuals like Mahesh Charan Sinha (also referred to as Mahesh Charan Singh), Lakshmi Chand, Pandit Tejshankar Kochak, Shankar Rao Joshi, Shitala Prasad Tiwari, Phuldeo Sahay Verma, Nihalkaran Sethi, Mukund Swarup Verma, Gorakh Prasad, Satyaprakash and Braj Mohan to name a few. This section attempts

[259] Benoybhusan Roy, *Unish Satake Bangla Bhasay Bigyancharcha*, Kolkata: Naya Udhyog, 2002. His compilation of science writings in the nineteenth century stands testimony to this.
As far as rendering literature on science in Bangla was concerned, the great efforts of Ramendra Sundar Trivedi, the celebrated physics teacher and a creative disseminator of science through Bangla and Rabindranath Tagore's experiments to make Bangla the carrier of such ideas aided such efforts in the late nineteenth and early twentieth century. It must be noted that Tagore himself wrote *Vishva Parichay* and dedicated it to the celebrated physicists S.N. Bose. Rabindranath Tagore, *Vishva Parichay*, trans. by Hazari Prasad Dwiwedi, Allahabad: Indian Press Limited, 1937. For Ramendra Sundar Trivedi see Santanu Chacraverti, 'Ramendrasundar Trivedi: A Pathbreaking Populariser of Science in Bengal', in Narender K. Sehgal, Satpal Sangwan and Subodh Mahanti (eds.), *Uncharted Terrains: Essays on Science Popularisation in Pre-Independence India*, New Delhi: Vigyan Prasar, 2000, pp. 76-88.

to recount the rudiments of their contribution in disseminating science through Hindustani or Hindi during this period.

Mahesh Charan Sinha, professor of agriculture and craft at Gurukul Kangri University, Haridwar, had the distinction of rendering and presenting writings on physics, chemistry and botany in Hindi. He wrote three distinct books titled *Rasayan-shastra,* (Hindi Chemistry, 1909), *Vanaspati-shastra* (Hindi Botany, 1911) and *Vidhyut-shastra* (Hindi Electricity, 1915), covering chemistry, botany and electricity respectively.[260] The subject matter of these texts included basic ideas about atoms, molecules, gravity, gas, light, electricity, method of salt preparation, parts of plants and related aspects.[261] Sinha's engagement was often innovative, for instance, at the end of the *Rasayan-shastra*, he compiled a short rasayan-shastra kosh which was a brief compilation of terms related to chemistry coined in Hindi with their equivalence in English. This must have been a laborious exercise and implicit in this engagement was both a knoweldge of chemistry or chemical sciences and the ability to make Hindi amenable for creating, crafting and coining equivalent scientific terms.[262] These books lucidly presented the knowledge of science and technology to the literate public and particularly drew the attention of students. They ran into several reprints which explains the viability, utility and the importance of these writings for native students of Hindi medium and for local readers as well.

Mahesh Charan Sinha was born in 1882 in Lucknow and obtained his BA from the University of Allahabad. Subsequently, motivated by an advertisement in the *Advocate* about a scholarship to study technical education in Japan by a Sindhi *seth*, Wasu Mull, Sinha with great difficulty undertook a journey to Japan. Unfortunately for him, on meeting the Japan

[260] Mahesh Charan Sinha, *Rasayan-shastra athwa Hindi Chemistry*, Prayag: Indian Press, 1909; *Vanaspati-shastra athwa Hindi Botany*, Haridwar: Gurukul Kangri, 1911, and *Vidhyut-shastra athwa Hindi Electricity*, Prayag: Shri Raghvendra Press, 1915.

[261] Mahesh Charan Sinha (Singh) also published several articles on aspects of science in various Hindi journals of the time like *Saraswati*, *Vijnana*, *Madhuri*. Mahesh Charan Sinha, 'Bijli', *Saraswati*, April 1910, in S.G. Mishra (ed.), *Hindi mein Vigyan Lekhan ke Sau Varsh*, vol. 1, pp. 42-44; 'Surya Shakti', *Vijnana*, April, 1917, in S.G. Mishra (ed.), *Hindi mein Vigyan Lekhan ke Sau Varsh*, vol. 1, pp. 88-91; 'Gandh Vigyan', *Madhuri*, 1926, in S.G. Mishra (ed.), *Hindi mein Vigyan Lekhan ke Sau Varsh*, vol. 1, pp. 169-177.
This anthology is a compilation of select articles on popular science in Hindi written by individuals like Mahesh Charan Sinha and his contemporaries by Shiv Gopal Mishra in two volumes. See Shiv Gopal Mishra (ed.), *Hindi mein Vigyan Lekhan ke Sau Varsh (Hundred Years of Science Writing in Hindi: 1850-1950)*, vol. 1 & 2, New Delhi: Vigyan Prasar, 2001, 2003.

[262] Mahesh Charan Sinha, *Rasayan-shastra athwa Hindi Chemistry*, Prayag: Indian Press, 1909.

based merchant he discovered that the latter had instituted no such scholarship![263] Unfazed, Sinha persevered for a year in Japan acquiring technical skills like umbrella and hoisery making and then moved to America where he enrolled himself for a degree at the prestigious Oregon Agricultural College in Corvallis.[264] After returning to India, Sinha worked in various capacities that included his stint as principal of a college named the Prem Mahavidhalaya at Vrindavan. Subsequently, given his training in agriculture, he joined the newly established Gurukul Kangri University, a native, nationalist and Arya Samaj institution at Haridwar, as professor of agriculture and botany. The institutional history of Gurukul Kangri attests to his presence among the initial group of teachers and to his role in bringing out science publications in Hindi.[265] The others in this initial group at the Gurukul were Prof Sathe, Sriyukt Govardhan, Prof Ramsharandas Saxsena, Prof Prannath, Prof Balkrishna, and Prof Sudhakar.[266] By choice and as an expression of the ideals of the Gurukul, its initial founder-teachers took upon themselves the arduous responsibility of bringing out science textbooks in Hindi. Perhaps, the complementarity that existed among this initial group of teachers at the Gurukul gave further agency to the need for popularising and disseminating science through publications in Hindi. Similar endeavours were further undertaken by individuals and institutions founded under the aegis of national education and swadeshi in slightly different contexts and in other regions of the country as well.

As part of his science publication and popularisation efforts, Sinha also tried to establish a joint stock company to bring out science books in Hindi. At the end of his book on Hindi Chemistry, Sinha shared something unique and interesting in the form of an appeal to Hindi lovers and prospective readers and users of the book that he had rendered so laboriously and diligently. This appeal is interestingly captioned 'Vigyapan' or advertisement and begins with the admission that many readers have been writing and requesting him to also render books of physics and agriculture in Hindi. Such repeated requests, Sinha construed, was an encouraging proof that Hindi knowing students and literati were becoming

[263] Lucy Carroll, 'The Seavoyage Controversy and the Kayasthas of North India, 1901-1909', *Modern Asian Studies*, vol. 13, no. 2, 1979, pp. 293-94. As Carroll informs, Wasu Mull objected to the misrepresentation of his intentions by the *Advocate*'s editor Ganga Prasad Verma who had advertised the scholarship in his name.
[264] Lucy Carroll, 'The Seavoyage Controversy and the Kayasthas of North India, 1901-1909', p. 294.
[265] *Gurukul Kangri Visvavidhalaya ka Sanshipt Itihas, 1901-1930*, Haridwar: Prakashan Mandir, pp. 10-11. This short and succinct history provides a glimpse of a particular shade of the national education experiment that was initiated at Gurukul Kangri. Instruction in Hindi at college and university levels where none had existed was one of the enduring contributions of Gurukul Kangri. At a time when there were no books especially in various science subjects and mathematics in Hindi, the founding teachers of Gurukul Kangri rendered textbooks on these subjects in Hindi to fill the void. Mahesh Charan Sinha was one of the initial teachers who wrote textbooks on science in Hindi.
[266] Ibid., p. 10.

more inclined towards pursing science, and was a sure sign of people awakening from their inertia and slumber. To practically realise the goal of rendering books in Hindi on various aspects of science, Sinha argued, a number of assistants and a rich library would be required and a corpus fund was sine qua none.[267] In the swadeshi spirit of the times, Sinha came up with the unique idea of floating a joint stock company worth a lac of rupees to sustain the endeavour on a long term basis. He appealed to science and Hindi lovers imbued with the swadeshi spirit to purchase shares of this company with the minimum value of each share being five rupees. The company could only take off if two thousand cooperative shareholders were to come forward to invest. Sinha's unique swadeshi proposal to serve the cause of Hindi and science is truly insightful and instructive of the innovative spirit of the swadeshi era. Induced as he was with the spirit of swadeshi, Sinha's proposal of a share holding company to realise the goal of rendering books in Hindi actually underscored the fact that he could see far and beyond. Both in the pre-project era of academic funding and in contemporary times, this stands as a unique and unheard of venture.

Sinha's technical training and innovative instincts also led him beyond a purely academic engagement to prepare a wireless telegraphy or telephone in 1911 that worked satisfactorily at short range and was not an imitation of any other machine.[268] Amidst the Swadeshi movement, he noted that in order to develop scientism or the spirit of *sciencevetta* among common Indians, the twin aspects of the process of rendering and presenting scientific knowledge of the west in the mother tongue and the simultaneous search for indigenous knowledge were both important.[269] As he noted in his article 'India and the Outside World', 'knowledge of one's own powers and capabilities is as much necessary for further improvement as the knowledge of one's weaknesses.'[270]

Another individual who tried to initiate and inspire the inculcation and cultivation of science along with small-scale but sustainable swadeshi industries was the amateur and self styled Prof Lakshmi Chand (also popularly referred to as Laxmi Chand). His full biographical details are not known (death about 1922), however, he seemed to have earned an impressive array of degrees as attested by his popular tracts. The title page of his books

[267] Mahesh Charan Sinha, *Rasayan-shastra athwa Hindi Chemistry*, Prayag: Indian Press, 1909.
[268] *The Hindustan Review*, vol. 23, 1911, p. 230.
[269] Mahesh Charan Sinha, *Rasayan-shastra athwa Hindi Chemistry*, Prayag: Indian Press, 1909, p. 2; *The Hindustan Review*, Jan. 1908.
[270] Mahesh Charan Sinha, 'India and the Outside World', *The Hindustan Review*, Jan. 1908, pp. 46-50. See particularly p. 48.

reveal that besides a masters from Allahabad University, he earned an MSc from Victoria, England, FCS (London), AMT (Manchester) and was a medalist of the City and Guilds of London Institute. The title page of his books also informs us that he became a professor of applied chemistry in Baroda state. He was a self-styled publicist of the *Vigyan Hunarmala* series of publications that published books on science based skill and everyday technologies in Hindi.

Lakshmi Chand was a publicist and populariser of skill-based low cost industrial processes as a propagator of swadeshi and industrialism who advocated the deployment of 'everyday technology' for the production of daily use products on a modest scale. His Hindi tracts and pamphlets on skill-based commodities like soap, detergents, dyes, and ink made him an important author, populariser and enthusiast of the swadeshi and scientific spirit. As part of a science series in Hindi (the Vigyan Hunarmala Series), Lakshmi Chand published several books like *Roshnai Bnane ki Pustak* i.e. a book on ink making in 1915 that was reprinted in 1916, 1918 and 1931. His other books were *Sughandit Sabun Bnane ki Pustak* (1915) on manufacturing scented soap which also ran into several reprints; *Tel ki Pustak* (1916) i.e. a book on aspects of oil processing, and *Tantukala* (1922) on the art and craft of textiles and weaving. He also edited *Rang ki Pustak* (1916) and *Warnish aur Paint* (1917) which were books on colour and dye, and varnish and paint manufacture.[271] All these books were brought out by the Vigyan Hunarmala Office at Banaras, the phrase 'Vigyan Hunarmala' literally meaning tracts on science-based skills. Essentially, these tracts were writings on everyday technology but were presented as disseminating and popularizing science-based entrepreneurial production. His books appeared to have been widely popular as some of them ran into several reprints within a short span of time. As is attested by their reprints, they were popular not because of their entertainment value but their utility and popularity were based on the fact that these booklets and tracts acted as manufacturing guides and primers for those small-scale native entrepreneurs who wanted to manufacture these commodities on a sustainable scale for Indian consumers. The products were to target those anticipated consumers whose economic location did not allow them to afford similar imported European commodities adorning the elite city stores.

[271] Lakshmi Chand, *Roshnai Bnane ki Pustak*, 1915; Hindi Science University Mala, No. I, Banaras City: Devi Prasad Agrawal, Vigyan Hunar Mala Office, 1930 (4th rpt.); *Sughandit Sabun Bnane ki Pustak*, 1915; Banaras City: Vidya Vilas Press, 1930 (4th rpt.); *Tel ki Pustak*, Hindi Science University Mala, No. III, Banaras City: Vigyan Hunar Mala Office, 1916; *Rang ki Pustak* (ed.) 1916, Banaras City: Pub by Devi Prasad Agarwal, Shri Lakshmi Narayan Press, 1919 (2nd edn.); *Warnish aur Paint* (*Raughan Sazshi*) (ed.), Banaras City: Vigyan Hunar Mala Office, 1917 and *Tantukala*, Banaras City: Vigyan Hunar Mala Office, 1922.

As evident, these books and tracts were printed and reprinted in the immediate years that followed the ebbing away of the swadeshi movement as a political movement. It is also a curious fact that Lakshmi Chand's writings appeared at the same time when, in the context of the First World War (WWI), the Indian Industrial Commission (1916-18) was created to reflect upon and recommend on the nature and scope of industries in India in the larger context of the industrial role of India for the imperium.[272] The long-drawn war made it amply clear to the metropolis that the colony must also have an industrial role to aid the empire. A colony like India was to acquire a subservient industrial role for industrialised Britain as exigencies like war production in the colony during WWI had made it apparent. It is in this wider context that one has to underline and appreciate the science-swadeshi spirit of Lakshmi Chand. Here was a man of Hindi heartland who was publishing tracts on such techniques for, which David Arnold has coined the apt phrase 'everyday technology'. It is through these tracts that Lakshmi Chand was infusing and incubating science based small-scale sustainable industrialism.[273]

Like Mahesh Charan Sinha and Lakshmi Chand, Sukhsampatti Rai Bhandari (born in 1895), a journalist and the proprietor of the Dictionary Publishing House from Jaitaram area of Rajasthan, also wrote in Hindi to create awareness about Indian scientists and their inventions. Bhandari was a man of many parts though he made a mark as an illustrious journalist serving as editor of several regional newspapers like *Ventakeshwar Samachar* in 1913, *Sadharma Pracharak* in 1914, *Patliputra* in 1915, *Mallari Marthand/Marthad* in 1916, *Naveen Bharat* in 1923 and most importantly the agricultural magazine *Kisan* from 1926 to 1930.[274] He was also the editor of an English-Hindi dictionary that ran into seven volumes.[275]

Notwithstanding his journalistic engagements, Bhandari was keenly interested in science, especially agricultural science. His book *Vigyan aur Avishkaar* was a treatise on science and inventions published in 1919.[276] He also wrote a text called *Sulabh Krishi-shastra*, on agricultural practices in the country.[277] According to Bhandari, none other than Lala Lajpat Rai and scores of other agriculturists, and men of agricultural sciences in India

[272] *Report of the Indian Industrial Commission, 1916-18,* London, 1919.
[273] David Arnold, *Everyday Technology: Machines and the Making of India's Modernity*, Chicago: The Chicago University Press, 2013.
[274] Kalidas Kapoor and Prem Narayan Tandon (comp.), *Hindi-Sewi Sansar* (1944); Lucknow: Vidya Mandir, 1951 (2nd edn.), p. 322.
[275] This dictionary was published by his Dictionary Publishing House at Ajmer.
[276] Sukhsampatti Rai Bhandari, *Vigyan aur Avishkaar*, Holkar Hindi Granth Mala No. 6, Indore: Shri Madhya Bharat Hindi Sahitya Samiti, 1919.
[277] Sukhsampatti Rai Bhandari, *Sulabh Krishi-shastra*, vol. 1, Indore: Kisan Karyalaya, 1932.

welcomed and recommended his *Sulabh Krishi-shastra*. He also duly acknowledged the works of his contemporaries, Pandit Tejshankar Kochak and Shankar Raoji Joshi and agricultural experts like Mr Howard, of Indore Plant Research Institute, Mr Mann, Director of Bombay Agricultural Department, Mr. Allen, Principal of Nagpur Agricultural College, and Mr John Keno's work on intensive farming in India in his writings. Bhandari definitely consulted dozens of books on agricultural sciences from various regions in order to distill their essence and wisdom in his own book on agriculture.

The swadeshi agenda to popularise the use of science-based small technologies in the field of agriculture was simultaneously initiated by Pandit Tejshankar Kochak, Shankar Raoji Joshi and Shitala Prasad Tiwari. Born around the year 1880, after obtaining his BSc and PAS, Pandit Kochak worked as lecturer at Agricultural College, Kanpur and also officiated as Agricultural Chemist to the Government of United Provinces. Thereafter, he became the Principal of the Government Agriculture School at Bulandshahr and authored various books titled *Paimaiash* (on measurement, 1919), *Kapas aur Bharatvarsha* (on Indian cotton, 1920),[278] and *Krishi Shastra* (on agriculture, 1924, 3rd edn.).[279] Shankar Rao Joshi, a resident of Lucknow, was an agricultural officer who was associated with the Vigyan Parishad, Allahabad and its mouthpiece the *Vijnana*.[280] He wrote articles on agricultural sciences, gardening, insects (on *Jhingur, Tiddi* etc.) and authored several books including *Varsha aur Vanaspati* (on rainfall and plants, 1923), *Kalam Paiband* (on grafting, 1940) and *Udyana,* (on gardening, 1948, 3rd edn.).[281]

Another intellectual, Shitala Prasad Tiwari, the translator of Meston Agriculture Book and the editor of *Kisanoparak*, was an assistant farm supervisor of the Agricultural Institute, Allahabad. He also taught agriculture at Hindi-Vidyapith and Hindi Sahitya-Sammelan. His book *Krishi-Vigyan* (on agricultural science, 1926), volume one, a tome of 900 pages, was

[278] Pandit Tejshankar Kochak, *Paimaiash* (1919), *Kapas aur Bharatvarsha* (1920), as mentioned in Mata Prasad Gupta, *Hindi Pustaka Sahitya1867-1942*, Allahabad: Hindustani Academy, 1945, pp. 156-58.
[279] Pandit Tejshankar Kochak, *Krishi Shastra*, Bulandshahr: Badri Printing Works, 1924 (3rd edn).
[280] As per Shiv Gopal Mishra, *Vijnana*, the monthly magazine of the Vigyan Parishad began to be published from 1915. However, B.K. Sen dates the magazine to the 1913, which was the founding year of the Vigyan Parishad. See Shiv Gopal Mishra, 'Introduction', in S.G. Mishra (ed.), *Hindi mein Vigyan Lekhan ke Sau Varsh*, vol. 1, p. xiv; B.K. Sen, 'General Scientific Societies in British India', *Indian Journal of History of Science*, vol. 52, no. 2, 2017, pp. 205-06.
[281] Shankar Rao Joshi, *Varsha aur Vanaspati*, Vigyan Granthmala no. 18, Prayag: Vigyan Parishad, 1923; *Udyana,* Ganga Pustakmala Pushp 11, Lucknow: Ganga Pustakmala Karyalaya, 1948 (3rd edn.); and *Kalam Paiband*, Allahabad: Vigyan Parishad, 1940. Also see *Vijnana*, vol. 15, Apr-Sept. 1922; 'Vatavaran', *Saraswati*, November 1923, in S.G. Mishra (ed.), *Hindi mein Vigyan Lekhan ke Sau Varsh*, vol. 1, pp. 131-40. Also see 'Chandra Prakash aur Vrikshon per Prabhav', *Vijnana*, Jul-Sept. 1950, in S.G. Mishra (ed.), *Hindi mein Vigyan Lekhan ke Sau Varsh*, vol. 2, pp. 410-11.

introduced by H.N. Batham, the Agricultural Chemist to the Government of United Provinces.[282] C.S. Mishra, the first Assistant Imperial Entomologist, translated Bulletin No. 28 of Agricultural Research Institute Pusa, that dealt with lac.[283] Apart from the individuals discussed, there were many others who wrote about various aspects of agriculture and farming though their biographical details are unknown. These writings reflected a growing consensus on the importance of modern science in increasing production and productivity in agriculture and were definitely an indication of a 'growing conviction among the Hindi intelligentsia that modern methods and scientific techniques of cultivation constituted an important aspect of agricultural modernization.'[284]

In the 1930s, the attempts to spread scientific information, knowledge and consciousness about human anatomy, elementary physics, chemistry, craft and technology were also undertaken by students, teachers, and professionals associated with institutions of higher learning such as Banaras Hindu University and University of Allahabad. Among them, Prof Phuldeo Sahay Varma, Dr Nihalkaran Sethi, Dr Mukund Swarup Verma, Dr Satyaprakash, Dr Gorakh Prasad and Dr Braj Mohan were prominent. With a motive to spread science both among students and the masses, these scholars wrote scientific books in Hindi. Prof Phuldeo Sahay Varma, was born in 1889 in Saran district, Bihar and obtained various educational qualifications including a masters in chemistry from Presidency College, Calcutta University and higher qualifications like AIISc from IISc, Bangalore.[285] As an impressionist student at Calcutta, teachers like P.C. Ray made deep impact upon him. Similarly, at IISc he must have had occasion to intimately interact with J.J. Sudborough, the head of the amalgamated Department of Chemistry.[286] He eventually joined BHU and became renowned as a chemistry teacher. Apart from his research publications and books in English, he rendered several books in Hindi to enhance the scope of science for students. His

[282] Shitala Prasad Tiwari, *Krishi Vigyan*, vol. 1, Foreword by H.N. Batham, Allahabad: Ram Dayal Agarwal, 1926. H.N. Batham or Har Narayan Batham who was an agricultural chemist in United Provinces is not to be confused with another illustrious man of science namely Sam Higginbottom, the founder of Allahabad Agricultural Institute which is the present day Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS). Higginbottom was close to Madan Mohan Malaviya and had advised him to open up the Faculty of Agricultural Sciences at BHU.

[283] C.S. Mishra, *Hindustan mein Lakha*, Calcutta: Superintendent Government Printing, 1914.

[284] Sandipan Baksi, 'The Hindi-Speaking Intelligentsia and Agricultural Modernisation in the Colonial Period', *Review of Agrarian Studies*, vol. 6, no. 2, 2016, pp. 98-122. Also see S. Mishra, *Hindi Vigyan Sahitya ka Sarvekshan*, Hindustani Academy, Allahabad, 2004.

[285] Dinesh Mani, 'Swatantrata Purva Vigyan Lekhan mein Prof. Phuldeo Sahay Verma ka Yogdan', in Shiv Gopal Mishra and Dinesh Mani (ed.), *Vigyan Lokpriya Karan: Prarambhik Prayaas*, New Delhi: Vigyan Prasar, 1997, p. 20.

[286] B.V. Subbarayappa, *In Pursuit of Excellence: A History of the Indian Institute of Science*, New Delhi: Tata McGraw Hill Publishing Company, 1992, pp. 89-90.

writings include the *Sadharan Rasayan*, a two volume textbook on general chemistry, published as part of BHU Granthmala series in 1932 and *Prarambhik Angarik Rasayan*, a textbook on elementary organic chemistry published in 1948.[287] He authored a utilitarian and inquisitive book titled *Mitti ke Bartan* published in 1939 dealing with the raw materials, processes and machinery related to the manufacture of clay, stone and porcelain utensils.[288] He also published several popular articles on topics like food (*aahar*) and problems of nutrition (*khadya samasya*) in the *Vijnana* and other popular Hindi magazines of the time.[289] In his mature years, looking back at his life as an organic chemist and to fuel young minds fired with scientific curiosity, Varma wrote a series of popular but dense books on various chemical products that had revolutionised Indian industry and life. In this genre the various books were on petroleum, plastic, lac *(Lakh aur Chapra),* fertilizer *(Khaad aur Urvarak),* coal *(Koyla)*, and sugarcane and sugar (*Ikh aur Chini)*.[290]

Varma was also involved in preparing a dictionary of scientific terms. As assistant editor to the Scientific Terminology section of the Nagari Pracharani Sabha, Banaras, he compiled the *Hindi Vagyanik Shabdawali: Rasayan Shastra*.[291] Besides his academic engagement, he was also associated with the journal *Vijnana* of Vigyan Parishad, Allahabad and served as its president and vice-president.[292] Varma served science and Hindi and in turn served one of the ideals of national education, which was to propagate science through the mother tongue. As a compiler of dictionaries of scientific terms and as author of textbooks and popular books on science and craft he served the cause of science and swadeshi.[293]

Varma's contemporary and colleague, Nihalkaran Sethi (or Nihal Karan Sethi) also contributed to the science and swadeshi cause in a distinct way. After acquiring his MSc and DSc, Sethi begun his career in physics at Banaras Hindu University. He was also elected fellow of the Indian Academy of Sciences in 1935. Sethi was further involved in preparing

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[287] Phuldeo Sahay Varma, *Sadharan Rasayan,* 2 vols, Banaras: Kashi Hindu Vishwavidhyalaya, 1932; *Prarambhik Angarik Rasayan*, Banaras: Nandkishore and Brothers, 1948.
[288] Phuldeo Sahay Varma, *Mitti ke Bartan,* Prayag: Vigyan Parishad, 1939.
[289] See 'Aahar', *Ganga*, January 1934, in S.G. Mishra (ed.), *Hindi mein Vigyan Lekhan ke Sau Varsh (Hundred Years of Science Writing in Hindi: 1850-1950)*, vol. 2, New Delhi: Vigyan Prasar, 2003, pp. 211-17; 'Khadya Samasya', *Hindustani*, 1946, in S.G. Mishra (ed.), *Hindi mein Vigyan Lekhan ke Sau Varsh*, vol. 2, pp. 340-52.
[290] Dinesh Mani, 'Swatantrata Purva Vigyan Lekhan mein Prof. Phuldeo Sahay Verma ka Yogdan', in Shiv Gopal Mishra and Dinesh Mani (ed.), *Vigyan Lokpriya Karan: Prarambhik Prayaas*, New Delhi: Vigyan Prasar, 1997, p. 25.
[291] Phuldeo Sahay Varma (comp.), *Hindi Vagyanik Shabdawali: Rasayan Shastra*, Prakirnak Pustakmala no. 22 (2), Prayag: Indian Press Limited, 1930.
[292] *Vijnana,* vol. LXXXIX, no. 1, Apr. 1959.
[293] Kalidas Kapoor and Prem Narayan Tandon (comp.), *Hindi-Sewi Sansar* (1944); Lucknow: Vidya Mandir, 1951 (2nd edn.), p. 152.

the Hindi vocabulary for scientific terms in physics as part of *Prakirnak* book series which was approved by the Kashi Pracharini Sabha's Committee of Word Definition. His books included, *Prarambhik Bhotik Vigyan* (elementary physical sciences, 1930) *Hindi Vagyanik Shabdawali: Bhotik Vigyan* (compendium of Hindi scientific terms pertaining to physics or physical sciences, 1929), and *Chumbakatava Aur Vidhyut* (magnetism and electricity, 1960).[294] Sethi further collaborated with the distinguished teacher of chemistry at Allahabad University, Dr Satyaprakash and authored a book on the standardisation of scientific weights and measures from Vigyan Parishad titled *Vaigyanik Pariman* (1928).[295] Like his colleague, Phuldeo Sahay Varma, Sethi too was involved in preparing a compendium of Hindi scientific terms for the Nagri Pracharani Sabha and compiled the *Hindi Vagyanik Shabdawali: Bhotik Vigyan*.[296] Again like Phuldeo Sahay Varma, he remained associated with the *Vijnana* and published several popular articles on scientific themes like theory of light (*prakash*), vision (*drishti*), electricity (*vidhyut*) and electrification (*vidhyutkaran*) in the journal.[297] Sethi was not just an author of university level textbooks in Hindi and a popular writer on aspects of physics in *Vijnana*, but was a well posted physicist in his own right. His research articles also appeared in journals like *Physical Review* published by the American Physical Society. [298] He was with BHU from its inception and must have soiled his hands in the swadeshi spirit of institution building in creating the rudiments of the physical laboratory at BHU. Prof Sethi later served Agra College both as a teacher and as its Principal.

Dr Mukund Swarup Verma, born in 1896 at Sikandarabad, obtained his MSc and MBBS degrees and became the Chief Medical Officer at BHU. He also wrote on science, health and anatomy in Hindi with the aim of spreading and supporting scientific knowledge and awareness among students of medical colleges, medical schools in particular and the

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[294] Nihalkaran Sethi, *Prarambhik Bhotik Vigyan*, Hindu Vishwavidhyalaya Granthmala, Banaras: Kashi Hindu Viswavidhyalaya, 1930; *Prarambhik Bhotiki*, Hindu Vishwavidhyalaya Granthmala No. 187, Banaras: Chaukhamba Sanskrit Series Office, 1948 (2nd rpt.); and *Chumbakatava Aur Vidhyut*, Allahabad: Hindustani Academy, 1960.

[295] Nihalkaran Sethi and Satyaprakash, *Vaigyanik Pariman*, Prayag: Vigyan Parishad, 1928.

[296] Nihalkaran Sethi (comp.), *Hindi Vagyanik Shabdawali: Bhotik Vigyan*, Prakirnak Pustakmala no. 22 (1), Prayag: Indian Press Limited, 1929.

[297] See Nihalkaran Sethi, 'Sarvavyapi Ether aur Prakash Siddhant', *Vijnana*, vol. VI, no. 3, Dec. 1917, pp. 99-102; 'Vidhyut aur Vidhyutkaran', *Vijnana*, vol. VI, no. 4, Jan. 1918, pp. 155-63; 'Vidhyut Spandan', *Vijnana*, vol. VI, no. 6, Mar. 1918, pp. 245-50; 'Prakash Vigyan', *Vijnana*, vol. IX, no. 1, Apr. 1919, pp. 30-35. Also see 'Drishti', *Vijnana*, March 1919 in S.G. Mishra (ed.), *Hindi mein Vigyan Lekhan ke Sau Varsh*, vol. 1, pp. 103-106.

[298] Nihalkaran Sethi, 'Effect of a Retarding Plate on White Light Interferometer Fringes', *Physical Review*, vol. 23, 69, pub. 1 Jan 1924. It is also to be noted that Pramod Karan Sethi, the famous orthopaedic who created the Jaipur Foot was the illustrious son of Prof Nihalkaran Sethi, the physicist. Also see Rakesh Bhargava, 'P.K. Sethi (1927-2008)', Personal News, *Current Science*, vol. 94, no. 9, 10 May 2008, pp. 1206-07.

literate masses of northern India. His publications included *Shishu Palan* (natal care, 1925), *Swasthya Vigyan* (health and hygiene, 1931), *Manava Sharir Rahasya* (anatomy, 1928), *Vish Vigyan* (science of poison, 1932), and *Manav Sharir Rachana Vigyan* (anatomy, 1938).[299]

Various individuals at Allahabad were also involved in disseminating and popularizing science among the literate masses. The contributions of Dr Satyaprakash (or Satya Prakash) and Dr Gorakh Prasad in this regard are particularly noteworthy. After obtaining his MSc and FICS, Satyaprakash taught chemistry at Allahabad University and also served as the editor of *Vijnana* in the 1930s. Satyaprakash was a historically inclined scientist and, in some sense, he was a savant in the footsteps of Acharya P.C. Ray. As a young teacher of chemistry he must have derived inspiration from Nil Ratan Dhar's enduring presence as a towering figure of chemistry at the University of Allahabad. Satyaprakash also empathised with the craft and chemical traditions of India and the synergy between them. Even when he wrote textbooks he took care to preface them by providing a panoramic view of the Indian tradition of chemistry. He also aspired and desired for chemical science to be utilised in the refinement of everyday technologies for manufacturing commodities and wage goods. He shared the larger vision of P.C. Ray in the application of chemistry to remedy unemployment by creating entrepreneurship, employment and self-reliance. Satyaprakash collaborated with Nihalkaran Sethi, the physicist and Gorakh Prasad, the mathematician along with many of his peers to sustain the Vigyan Parishad at Allahabad and its mouthpiece, *Vijnana.* He wrote popular textbooks on inorganic chemistry in Hindi like the *Sadharan Rasayan* and *Samanya Rasayan Shastra* for students at college and university levels.[300] He also authored historical treatises like *Prachin Bharat mein Rasayan ka Vikas*, which is a classic text also used by erudite Ayurveda Acharyas as a refined and sophisticated exposition of alchemical and chemical traditions as codified in various ancient texts.[301]

Apart from these dense textual treatises, Satyaprakash also rendered *Shrishti ki Katha* (1937) published from Hindi Sahitya Samelan, Prayag.[302] This was part of a different genre

[299] Mukund Swarup Varma, *Shishu Palan*, Manoranjan Pustak Mala no. 43, Banaras: Kashi Nagri Pracharini Sabha, 1925; *Manava Sharir Rahasya*, vol. 1, Sahitya-Suman-Mala-Pushp 5, 1928; Lucknow: Naval Kishore Press, 1949 (2nd rpt.), *Swasthya-Vigyan*, Banaras: Kashi Hindu Vishwavidhyalaya, 1931 (1st edn.); *Vish Vigyan*, Banaras: Kashi Hindu Vishwavidhyalaya, 1932. *Manav Sharir Ranchana Vigyan*, 1938; Banaras: Kashi Hindu Vishwavidhyalaya, 1956 (2nd edn.).
[300] Satyaprakash, *Sadharan Rasayan*, Prayag: Vigyan Parishad, 1929; *Samanya Rasayan Shastra*, Allahabad: Bharti Bhandaar. 1951.
[301] Satyaprakash, *Prachin Bharat mein Rasayan ka Vikas*, UP: Prakashan Shakha, Suchana Vibhag Uttar Pradesh, 1960. Also see *Vaigyanik Vikas ki Bharatiya Parampara*, Patna: Bihar Rashtra Bhasha Parishad, 1954.
[302] Satyaprakash, *Shrishti ki Katha*, Prayag: Hindi Sahitya Sammelan, 1937.

of books written by Satyaprakash. *Shrishti ki Katha* is an exposition of the evolution of the universe including planet earth with its human and other living inhabitants and the ways of their habitations. He was also the chief editor of a multi-volume English to Hindi dictionary of scientific terms i.e. *Vaigyanik Shabd Kosh* brought out by the Bharatiya Hindi Parishad, Prayag.[303] Satyaprakash's oeuvre through this diverse genre of writing, apart from his role as professor of chemistry and as author of numerous research papers made him the initiator, inspirer and teacher par excellence for generations of students who pursued science as a vocation and profession.

Dr Gorakh Prasad was born in 1896 at Gorakhpur, obtained his DSc from Edinburgh, FRAS, and worked as a Reader at Allahabad University. More than these formal degrees, it is important to note that he was a pupil of the doyen of Indian mathematics Dr Ganesh Prasad. Ganesh Prasad himself was the bearer and carrier of the tradition of mathematics from Bapu Dev Shastri and Sudhakar Dwivedi. Gorakh Prasad intimately worked with Ganesh Prasad at Banaras in the initial years of BHU. As a teacher of mathematics at Allahabad University, he also served as the editor of *Vijnana*[304] and authored books and articles on diverse topics such as *Photography* (1931), *Saur Parivar* (on the Solar system, 1931), *Lakdi ki Polish* (on wood polish, 1940) and *Aakash ki Sair* (1937).[305] Gorakh Prasad as a mathematician, on the one hand, wrote comprehensive textbooks on higher mathematics (especially differential and integral calculus) for students at graduation and post graduation levels with an enduring shelf life, on the other hand, he along with the celebrated chemist Satyaprakash, edited and compiled books on strategies and skills to produce everyday commodities related to soap, ink, varnish, dye and materials related to photography. Such *hunar* or skills and *upyogi nuskhe* or useful recipes were meant to be handy in everyday life and vocation. This was a parallel vocation which they enthusiatically tried to popularise not only by compiling books but also through essays in the *Vijnana*.

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[303] Satyaprakash (chief ed.), *Vaigyanik Shabd Kosh*, vol. 1, Prayag: Bharatiya Hindi Parishad, 1948. The editorial board of this series also had as its members Nihalkaran Sethi (Physics), Phuldeo Sahay Varma (Chemistry), Braj Mohan (Mathematics), Mahavir Prasad Srivastava (Astronomy), Gyanprakash Dube, Krishna Bahadur and Satyaprakash (zoology and botany).

[304] *Vijnana,* vol. 56, Oct. 1942-Mar. 1943.

[305] Gorakh Prasad, *Photography,* Allahabad: Indian Press, 1931; *Saur Parivar*, Allahabad: Hindustani Academy, 1931; *Lakdi ki Polish*, Allahabad: Vigyan Parishad, 1940. According to Gorakh Prasad, this popular, utilitarian and skill enhancing book was written in cooperation with a gentleman named Ram Yatanji as mentioned in his introduction to his *Lakdi ki Polish*; *Aakash ki Sair*, Allahabad: Indian Press, 1937. Also see 'Samay', *Saraswati*, August, 1923 in S.G. Mishra (ed.), *Hindi mein Vigyan Lekhan ke Sau Varsh*, vol. 1, pp. 123-30. See also Gorakh Prasad's essays on photography in'Photo Chapna', *Vijnana*, vol. 54, Oct.-Mar. 1941-42, p. 122.

As an editor of *Vijnana* in the early 1940s, Gorakh Prasad wrote several popular articles on aspects of craft and Indian tradition of industrialism. It was through *Vijnana* that he also informed readers about the latest news and information from the world of science and scientists. These teachers of higher science and mathematics, with as much indulgence and passion, endeavoured to foster and promote craft and everyday commodity production by fortifying such skills through science and everyday technologies. The apostles of Big science after 1940s pejoratively dubbed this applied science of nuancing and refining everyday technologies and craft as 'wax and sealing science'. Perhaps charmed by spectacular and high instrumentation science and the promises it held, these apostles of Big science did not appreciate the earnestness of university professors of science and mathematics like Gorakh Prasad and Satyaprakash who went beyond the precincts of their university labs to address concerns of youth unemployment by propagating science based manufacturing and skills. In a way, these men were carrying forward the ideals of one of the tallest Gandhian and humanist-scientist of the country, Acharya P.C. Ray, who wanted to make science in general and chemistry in particular a catalyst for industrialism and manufacturing as a means of employment and self-employment that would lead to productive and pecuniary self reliance of the youth.

An important contributor in the field of mathematics was the passionate practioner of mathematical science and teacher of high caliber, Dr Braj Mohan (or Brij Mohan). He took upon himself the responsibility of not only writing and publishing mathematical tracts in Hindi but also mastered the art of teaching and disseminating mathematical ideas and concepts in Hindi. Braj Mohan was born in 1908 in Moradabad, completed his masters from Agra, and obtained a doctoral degree from Liverpool. In 1934, he joined the mathematics department at BHU where he taught until his retirement. He also served as principal of the Central Hindu College of the BHU.[306] Despite being a mathematician, Braj Mohan had an enduring passion for Hindi, and in this sense, he served the cause of both science and Hindi. Like many of his contemporaries and colleagues at his university, Braj Mohan argued for the teaching of scientific and technical subjects, especially mathematics in the mother tongue. He recognised and particularly pointed out the lack of proper scientific terms and expressions in Hindi and the inadequacy of the Nagri alphabet for printing and typesetting. Throughout his

[306] Brij Mohan, *What Lies Beyond? A Collection of True Supernatural Stories*, New Delhi: Nine Books, 2016, pp. 271-75. This collection of supernatural stories was written by Dr Brij Mohan at a ripe age and published posthumously by his son. At the end of the book, a brief though insightful biodata of the author has been compiled citing his numerous contributions and achievements.

years of academic engagement, Braj Mohan suggested numerous reforms for the incorporation of mathematical symbols, special signs and operations in Hindi typesetting and printing. Among his award winning publications on the rendering of mathematics in Hindi, the *Ganitia Kosh* stands as a singular contribution.[307] His other Hindi publications include *Thos Jayamati* (on solid geometry, 1945), *Niyamak Jyamiti* (on co-ordinate geometry, 1951) and *Ganit ka Itihas* (history of mathematics, 1965).[308]

One also gets a glimpse, even if rather limited, of science writings and publications by women during the swadeshi era. Dr Chandrakanta Devi, a lecturer at Allahabad Medical College of Homeopathy wrote on health science.[309] The first edition of her book titled *Swasthya Vigyan* published in 1933 ran into a thousand copies. This book is an exhaustive companion on food, lifestyle, sanitation and aspects of general disease and affliction. It does not specifically touch on homoeopathy but is a general guide to healthy living for a family. Mrs Lakshmi Chand became the publisher of the book titled *Tantukala* in 1922 authored by her late husband Lakshmi Chand.[310] The names of women writers like Srimati Suman, Dr Radha Pant, Chandrika Prasad, Srimati Neera, Rani Tandon,[311] Kamala Sadgopal, Prabha Asthana, Nalini Sen, Shanti Guhi and Shakuntala Verma sporadically appear in the pages of science and literary magazines, although they remain largely unknown. They wrote on diverse themes related to science ranging from gold, numbers, salt preparation, to microbes, cultivation of pearls, fruit and vegetable preservation, properties of vegetables and their uses and sensory organs.[312]

Common among all the individuals discussed above of the swadeshi era from Mahesh Charan Sinha in chemistry to Nihalkaran Sethi in physics and Braj Mohan in mathematics was the endeavour to coin scientific terms in Hindi and widen the repertoire of Hindi scientific terminology. They tried to tease out, forge and synthesise words in Hindi for

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[307] Braj Mohan, *Ganitia Kosh*: *Ganitia Paribhasha aur Shabdavali*, Banaras: Chaukhamba Sanskrit Series, 1954.

[308] Braj Mohan, *Thos Jayamati*, 1945; *Niyamak Jyamiti: Vritt Samhita aur Shankav*, vol. II, Hindu Vishwavidhyalaya Granthmala – 20, Banaras: Birla Hindi Prakashan Mandal, Kashi Hindu Vishwavidhyalaya, 1951; *Ganit ka Itihas*, Hindi Samiti Granthmala – 102, Lucknow: Hindi Samiti, Suchana Vibhag, 1965. In this historical treatise, Braj Mohan highlights the contribution of Indian mathematics and mathematicians while surveying the larger history of mathematics across continents and civilisations. Several of his Hindi books have been reprinted by Vani Prakashan and are still in use today.

[309] Chandrakanta Devi, *Swasthya-Vigyan*, Prayag: Swasthya Mandir, 1933.

[310] Lakshmi Chand, *Tantukala,* Banaras City: Vigyan Hunar Mala Office, 1922.

[311] Rani Tandon, 'Anujivon ka Pratham Anweshek Leeuwenhoek', *Vijnana*, vol. 61, no. 4, Jul. 1945, pp. 73-80.

[312] Mishra's compilation has articles by these women writers on the themes mentioned. See S.G. Mishra (ed.), *Hindi mein Vigyan Lekhan ke Sau Varsh*, vols. 1 & 2.

processes, events, phenomena and various types of calculations in science and mathematics. In their own way they contributed to make Hindi amenable to carry forward scientific ideas and concepts. Braj Mohan even struggled with type setting of Hindi letters or blocks to make it amenable to represent mathematical notations and symbols. They did not succumb to the prevailing shortcomings of the language, but from within it, they tried to resolve them. Such sustained efforts could deliver in the era of science and swadeshi.

Such books on mathematics, physics, chemistry and botany in Hindi created confidence among students to apply and opt for science subjects at college and university levels. Vernacular primers about scientific production of everyday commodities by amateurs and semi-professionals who had acquired scientific and technical credentials to author such books testify to their engagement with the spirit of science, swadeshi and industrialism. Mata Prasad Gupta, a lecturer at the Department of Hindi, University of Allahabad, compiled a list of science books rendered or published in Hindi.[313] The production, proliferation and popularity of these books are clearly manifest by the multiple reprints they ran into. The proliferation of popular writings on science during the swadeshi era is also attested by the numerous popular articles that appear in the pages of literary magazines like *Saraswati*, *Madhuri* and *Sudha*, apart from the science magazine *Vijnana*.[314] Endeavours to popularise science were also initiated by institutions like the Nagri Pravardhini Sabha at Allahabad, which was under the secretaryship of Murlidhar Mishra. The institute facilitated the transalation of books that were not available in Hindi.[315] In association with the Peoples Bank Limited, Allahabad, the Sabha appealed to the public to contribute a minimum amount of Rs 5 for promoting the publication of scientific books in Hindi and as a means for the country's advancement. Such institutional endeavours were to complement and reinforce individual efforts and the search for a parallel alternative arrangement to the prevailing colonial education that had also begun in the early decades of the twentieth century, and will be taken up in a later section.

[313] Mata Prasad Gupta, *Hindi Pustaka Sahitya 1867-1942*, Allahabad: Hindustani Academy, 1945.
[314] At the end of his second volume, Shiv Gopal Mishra has compiled a list of articles on science that came out in literary magazines like *Sarawati*, *Madhuri* and *Sudha* in the first half of the twentieth century. Between 1900 and 1939, the *Saraswati* published 343 science related articles. A list of 50 science articles has been compiled from the *Madhuri* though the exact years are not given; and from 1928 to 1941, a list of 54 science related articles appeared in the *Sudha*. Another magazine *Vishal Bharat*, saw the publication of 158 science related articles between 1930 to 1950. See S.G. Mishra (ed.), *Hindi mein Vigyan Lekhan ke Sau Varsh*, vol. 2, pp. 412-23.
[315] Mahesh Charan Sinha, *Rasayan-Shastra athwa Hindi Chemistry*, Prayag: Indian Press, 1909, pp. 7-8.

It is more than evident that the contribution of the individuals discussed, influenced as they were by the spirit of swadeshi, not only opened avenues for students to enter colleges and universities to pursue science, but also animated science based skill and industrialism beyond the four walls of scientific labs. These struggles and contributions of the protagonists need to be documented and recorded in historiography. Their writings clearly indicate the fact that the attempts to engage with modernity on one's own terms, and the search for alternative ways of knowledge dissemination in the Hindi public sphere was shaped through the publication of these popular scientific writings in Hindi or Hindustani. Coeval to these processes, a few inclined individuals also went on to establish institutions and societies that started the publication of journals and magazines to systematically create awareness among Indians about the developments in natural sciences, mathematics, aspects of medicine, and agricultural sciences.

The proliferation of science and mathematics textbooks and popular books in Hindi surveyed in this section appeared from various Hindi series brought out by different publishers and samitis or societies of the period. Despite the number of books utilised here not presenting an exhaustive sample, one still comes across various series like Hindi Science University Mala Series, Holkar Hindi Granthmala Series, Hindu Viswavidhyalaya Granthmala Series, Prakirnak Pustakmala Series, Manoranjan Pustakmala Series, Sahitya Suman Mala Pushp Series and Hindi Samiti Granthmala Series of which these books were a part of. One can then plausibly argue that the books cited were not stray publications but were part of a planned effort to serve science, swadeshi and industrialism through Hindi.

Coeval to the vernacularisation of languages, these innumerable instances of rendering textbooks and popular books on science, technology and medicine in the vernacular (here it is Hindi) also reveal the efforts towards popularisation of science and skill based 'everyday technologies'. These tracts and their authors are seen seeking to create favourable opinion towards the products made through the deployment of science and skill based low cost every day technologies. Along with the products from the Indian craft traditions, a new range of swadeshi products were to emerge from these science-based everyday technologies to act as a comforting factor for Indian consumers for whom the imported products were unaffordable. This advocacy of the swadeshi spirit of science and production based upon it opened up alternative ways of replacing similar popular products of European modernity held as exemplars by the European modern individual (can also be read as colonisers).

This was true not just for the urban context and milieu but science was to inform the basic productive process and the larger activity of agriculture also. It is not incidental that numerous science-based tracts and books propagating novel and scientific ways of negotiating agricultural practices appeared in the vernacular. The array of all of these publications presented by the authors of these tracts were catalysing and strengthening the modern 'nation in the making'.

Individuals like Prof Mahesh Charan Sinha, Lakshmi Chand, Shri Sukampatti Rai Bhandari, Pandit Tejshankar Kochak and Prof Phuldeo Sahay Veama were engaged in negotiating science and modernity, imbued as they were with the spirit of science and swadeshi on their own terms. They were all trying to forge a sustainable and swadeshi way of negotiating modernity. For example, Prof Phuldeo Sahay Varma was not just the author of a textbook in general chemistry but he also deployed his chemistry in negotiating agriculture and ceramic crafts in search of new alternatives and sustainable swadeshi. The coupling of science and swadeshi can be seen in negotiation with the impinging European modernity on their own terms.

These men were professionals in their own right and were instrumental in creating a science community. Through their multiple and interventionist roles as educators, propagators and popularisers, they paved way for negotiating industrial European modernity through the spirit of science and swadeshi. In this sense they can be regarded as modernisers of India. For them science was not just for science's sake but was a powerful cultural referent and productive intervention in the larger quest of modernity. It is not incidental that many of these propagators of science and swadeshi targeted to bring in focus alternative ways of science-based production and tried to perpetuate such industrialism which could be sustainable in the Indian context.

This new industrialism was in affinity with the Indian or swadeshi craft tradition. As this new industrialism was imbued and suffused with the spirit of science and swadeshi, and swadeshi being the common factor by implication the other factor i.e. science and technology was also to be in affinity to craft and there was no hiatus in craft and science *per se*. Clearly craft and everyday technologies were amenable and conducive to science and technology for the champions and propagators of this new industrialism in the 1920s and 1930s.

Table 3.1: Hindi Books on Various Aspects of Science[316]

Agricultural Sciences

- Pyarelal, *Vitap-Vilap* (on gardening), 1897.
- Pyarelal, *Vrikshavali*, 1924 (3rd edition).
- Yamuna Shankar Nagar, *Krishi Vidya*, 1900.
- Mahavira Prasad, *Madhu-Makshika*, 1903.
- Hemant Kumari Devi, *Vaigyanik Kheti*, 1914.
- Ramprasad, *Gehun ki Kheti*, 1914.
- Ramprasad, *Mungfali tatha Macca ki Kheti*, 1918.
- Ramprasad, *Aloo ki Kheti,*1918.
- Ganesh Dutt, *Afim ki Kheti,* 1918.
- Shiv Narayan Khatri, *Bharat mein Kheti ke Tarike,* 1921.
- Shiv Narayan Khatri, *Dhoro ke Gobar aur Peshab ka Khad,* 1921.
- Shiv Narayan Khatri, *Dhoro me Pata Rog ki Visheshta,* 1921.
- Mukhtar Singh, *Paudha aur Khaad,* 1935.
- Mukhtar Singh, *Jal aur Jutai,* 1935.
- Mukhtar Singh, *Kheti,* 1935.
- Mukhtar Singh, *Bhoomi,* 1935.
- Hardyalu Singh Gupta, *Cigarette ki Tambaku ki Krishi aur uska Pakana,* 1937.

Cloth Craft

- Purnima Devi, *Un ki Bunai ki Pratham Shiksha*, 1906.
- Thakur Prasad Khatri, *Deshi Kargha,* 1908.
- Thakur Prasad Khatri, *Sughar Dargin* 1908 (Sewing).
- Thakur Prasad Khatri, *Sunari,* 1907.
- Veni Madhav Tripathi, *Masisagar*, 1897 (on ink making).
- Ramjivan Nagar, *Desi Button*, 1904.
- Mohanlal Sharma, *Pratibimb Chitra Chintamai*, 1889 (Photography).
- Lakshmi Chand, *Tantukala,* 1922.
- Jagannath Prasad, *Desi Rangai*, 1916.
- Dhirajlal Sharma, *Swadeshi Rang aur Rangna*, 1925.
- D.G. Kale, *Resho ki Rangai*, 1936.
- Shivcharan Pathak, *Rangai-Dhulai Vigyan,* 1938.

Military Science

- Pyarelal, *Vaan Vidya*, 1901.
- Ganga Prasad, *Nali ka Avishkar*, 1896.
- Satyanarayana, *Tank-Yuddh*, 1940.
- Satyanarayana, *Hawai Yuddh*, 1940.

Craft and Engineering

- Lazzaram Sharma, *Bharat ki Karigari*, 1902.
- Gangaprasad Gupta, *Deshi Karigari ki Dasha aur Swadeshi Vastu Swikar*, 1906. (A description on Indian craft is given with a perspective of Swadeshi).
- Thakur Prasad Khatri, *Sunari,* 1907.
- Madhavsingh Mehta, *Maap-Vidya Pradarshini*, 1909 (Plain Table Survey).
- Gangashankar Nagar, *Suwarnkari*, 1923.
- Kanailal Dere, *Mina-Vigyan*, 1937.
- Devdutt Arora, *Charma Bnane ke*

Medicine

- Pyarelal, *Kayakalpa,* 1901 (Special type of medical treatment).
- Satyabhama Devi, *Dhatri Vidya*, 1903 (on Allopathy).
- Mahendulal Garg, *Dantraksha,* 1896.
- Baldev Prasad Saxena, *Electro Homeopathy,* 1916.
- Mahendranath Bhattacharya, *Parivarik Chikitsa*, 1935 (5th edition, about Homeopathy)
- Manoranjan Banerjee, *Vrihat Materia Medica*, 1935 (Homepathy).

[316] See Mata Prasad Gupta, *Hindi Pustak Sahitya, 1867-1942*, Allahabad: Hindustani Academy, 1945.

Siddhanth, 1940.

- Chandlal, *Model-Shoemaker*, 1940.
- Ramnarayan Mishra, *Jildsazi*, 1941.
- Satyajivan Varma, *Jildsazi,* 1941.
- Jhaver Bhai Pu Patel, *Tel Ghani*, 1941 (2nd edn.).
- Omkarnath Sharma, *Loha aur Us pr Pani Chadhana*, 1933.
- Omkarnath Sharma, *Yantrik Chitrakari*, 1933.
- Omkarnath Sharma, *Vaccum Break*, 1933.
- Jyotiswarup Saklani, *Prakashan Vigyan*, 1932.
- Krishnaprasad Dar, *Aadhunik Chhapai*, 1939.
- Vishnu Dutt Shukla, *Proofreading*, 1941.
- Govardhan Das Gupta, *Hindi Typewriting*, 1940.
- Vindheshwari Prasad Mishra, *Bhartiya Vaastu-Vigyan*, 1933.

Chemistry

- Dr Baldeo Prasad Mishra, *Chemia,* 1899.
- Anand Bihari Lal, *Rasayanshastra*, 1906.
- Gopalswarup Bhargava, *Manoranjak Rasayan*, 1923.
- Vaudev Vitthal Bhagwat, *Prakash Rasayan*, 1932.
- Atmaram, *Rasayan Sambandhi Kuchh Lekh*, 1918.

Zoology and Botany

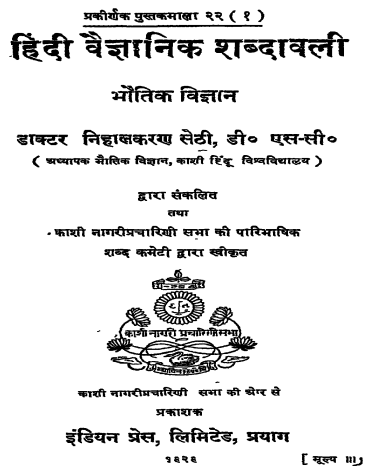
- Lakshminath Singh, *Jeev Jantu,* 1895.
- Prithvinath Singh, *Udbhivzz Vidya*, 1905.
- Mahesh Charan Singh, *Vanaspati Shastra,* 1921.
- Pravasilal, *Vriksh Vigyan,* 1920.
- Gayaprasad Mishra, *Jantu-Prabandh*, 1911.
- P.A.G.B. Sathe, *Vikasvaad,* 1914, (Published by Gurukul Kangri).
- Mukutvihari Varma, *Jeevam Vikas,* 1930.
- Dhirendranath Chakravarti, *Jivatva Janak*, 1932, (On Vitamins).
- Chandrashekhar Shastri, *Jeevan Shakti ka Vikas*, 1936.
- Jagdanand Rai, P*rakritiki*, 1925.
- Mahavir Prasad Dwivedi, *Vigyan Varta*, 1935.
- Yatindrabhushan Mukherjee, *Vaigyaniki,* 1936.
- Ramdas Gaur, *Vigyan-Hastamalak*, 1939.
- Sachindranath Sanyal, *Vanshanukram-Vigyan,* 1939, (on heredity).

Physics

- Premvallabh Joshi, *Taap,* 1915.
- Pandit Narayanprasad, *Padarth-Vidya,* 1908.
- Vrindaprasad Shukla, *Vayuyaan,* 1919.
- Jagpati Chaturvedi, *Samudra pr Vijaya*, 1929.
- Jagpati Chaturvedi, *Vayu pr Vijaya*, 1929.
- Jagpati Chaturvedi, *Vayu ke Chamtkar*, 1941.
- Jagpati Chaturvedi, *Aag ki Kramaat,* 1941.
- Sampurnanda, *Jyotirvinod,* 1917.
- Vindheshwari Prasad Mishra, *Saur-Samrajya,* 1922.
- Ramchandra Varma, *Bhukamp, 1*918.
- Girijaprasad Sharma, *Vimaan,* 1941.

ग्रन्थकर्त्ता—महेशचरणसिंह

Figure 3.1: Prof Mahesh Charan Sinha (Singh)



प्रकीर्णक पुस्तकमाला २२ (१)

हिंदी वैज्ञानिक शब्दावली

भौतिक विज्ञान

डाक्टर निहालकरण सेठी, डी० एस-सी०

(अध्यापक भौतिक विज्ञान, काशी हिंदू विश्वविद्यालय)

द्वारा संकलित

तथा

काशी नागरीप्रचारिणी सभा की पारिभाषिक

शब्द कमेटी द्वारा स्वीकृत

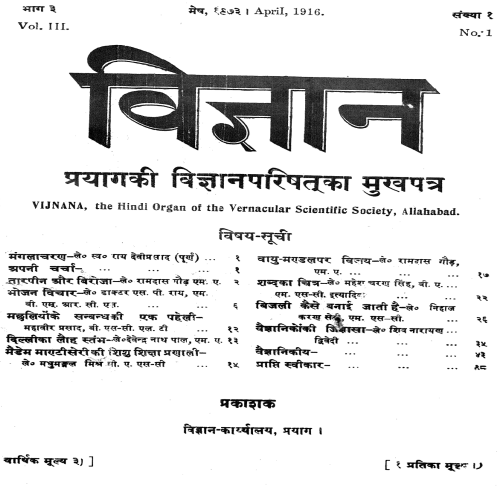
काशी नागरीप्रचारिणी सभा की ओर से

प्रकाशक

इंडियन प्रेस, लिमिटेड, प्रयाग

१९२६ [मूल्य ॥)

Figure 3.2: *Hindi Vagyanik Shabdawali: Bhotik Vigyan* compiled by Dr Nihalkaran Sethi



भाग ३ Vol. III. मेष, १९७३ । April, 1916. संख्या १ No. 1

विज्ञान

प्रयागकी विज्ञानपरिषत्का मुखपत्र

VIJNANA, the Hindi Organ of the Vernacular Scientific Society, Allahabad.

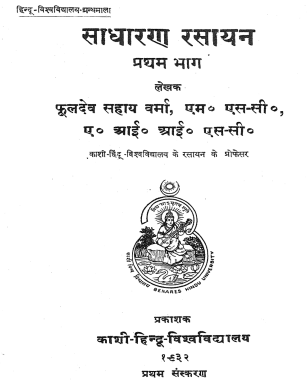
विषय-सूची

प्रकाशक

विज्ञान-कार्य्यालय, प्रयाग ।

वार्षिक मूल्य ३)] [१ प्रतिका मूल्य ।)

Figure 3.3: Title page of *Vijnana* of 1916



हिन्दू-विश्वविद्यालय-ग्रन्थमाला

साधारण रसायन

प्रथम भाग

लेखक

फूलदेव सहाय वर्मा, एम० एस-सी०, ए० आई० आई० एस-सी०

काशी-हिंदू-विश्वविद्यालय के रसायन के प्रोफेसर

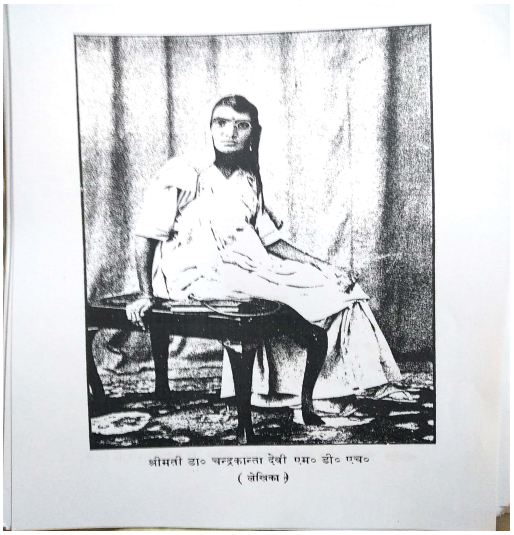
प्रकाशक

काशी-हिन्दू-विश्वविद्यालय

१९३२

प्रथम संस्करण

Figure 3.4: *Sadharan Rasayan* by Phuldeo Sahay Varma



श्रीमती डा० चन्द्रकान्ता देवी एम० डी० एच०

(लेखिका)

Figure 3.5: Dr Chandrakanta Devi

Visions of Science (*Vijnana*): Discussing the *Dawn* of *Modern Hindustan*[317]

During the ongoing phase of the Swadeshi movement, a number of constructive institutions, like national schools, colleges and swadeshi industries were set up. The National Council of Education (NCE) and the Bengal National College were the exemplars of this era of swadeshi. So was the Bengal Technical Institute which was later nurtured by the NCE and ultimately blossomed into the present day Jadavpur University. The aim was to educate the nation on one's own terms and further modernise the country and rejuvinate its industries along with the spirit of entrepreneurship. Similarly, agriculture was to benefit from sciences. Several institutes, particularly the Dawn Society, Vigyan Parishads, and various Vidyapiths and other nationalist societies, organisations and institutions were established as an alternative to the colonial system of education and knowledge production. Among those constructive institutions, Satish Chandra Mukherjee's Dawn Society and its monthly magazine *The Dawn* played a seminal role in the national education movement.[318] The Dawn Society proved to be the incubator of the NCE experiment. Mukherjee in an article titled 'The Birth of the National Idea' published in the November 1905 issue of *Dawn* drew the public's 'attention to the close relation between national education and national consciousness.'[319] Coeval to the birth of the idea of national education as the backbone of swadeshi, the notion of a national university was also doing the rounds in the press. Brahma Bandhab Upadhyaya was among the first to invoke the demand for a national university through his paper, the *Sandhya*, even before the beginning of the swadeshi movement, in July 1905.[320] The Bengali writer-journalist Hemendra Prasad Ghose, in a long letter titled 'What to do? A Proposed University' published by *Telegraph* in October 1905 raised a similar demand.[321]

The *Dawn* magazine was founded in 1897 at Calcutta by Satish Chandra Mukherjee (1865-1948) to introduce the younger generation to oriental religion, literature, culture,

[317] This subheading has been composed from the names of some of the leading journals of the early twentieth century that mirrored the efforts towards building a modern Hindustan through discussions on the cultivation of science. The journals from which this discussion has been drawn are the *Dawn* magazine of the Dawn Society (1897-1912), *Vijnana* (1915-), *Modern Review* (1907-), *Hindustan Review* (1905-1954). T*he Hindustan Review* inherited the *Hindustan Review and Kayastha Samachar* which was published from 1903 to 1905.
[318] Dhruv Raina and S. Irfan Habib, 'The unfolding of an engagement: "The Dawn" on Science, Technical education and industrialization: India, 1896-1912', *Studies in History*, vol. 9, no. 1, 1993, pp. 87-117.
[319] Amitabha Mukherjee, *Fifty Years of National Education: The Story of an Experiment 1906-1966,* Calcutta: National Council of Education, Bengal, p 33. For the evolution of the idea of National Education, also see various issues of *The Dawn* from 1902 onwards; and from 1904-1910 when it was published as *The Dawn and Dawn Society Magazine.*
[320] Ibid., p. 30.
[321] Ibid., pp. 31-32.

philosophy, and most importantly science and industrialism. In doing so, the journal tried to imbue its readers with substantive knowledge about the intellectual heritage of India's art, craft and architecture, on the one hand, and achievements in science by Indians in contemporary times, on the other. Later, Mukherjee established the Dawn Society in 1902 dedicated to the cause of spreading national education. From its inception, 'character building was a fundamental item in the ideological complex of the Dawn Society'.[322] Its activities were divided into many sections – 'General, Moral, Religious and Industrial'. Industrial news and deliberation and discussion on the need for regeneration through industrial education juxtaposed to the pros and cons of India's own artisanal and craft heritage remained an important agenda of the *Dawn* magazine and found even more space after the inception of the Dawn Society in 1902, and its merger with *Dawn* magazine in 1904. From the initial days of the Dawn Society the activity of 'the Industrial section [was] specially significant in view of the fact that it was well calculated to infuse the swadeshi spirit into the young students and the public even before the beginning of the Boycott-Swadeshi movement in August 1905.'[323] After the merger, the magazine was renamed *The Dawn and Dawn Society's Magazine* and continued till 1913. The members of the Society were noted intellectuals and intelligentsia of Bengal of the time, including Rabindranath Tagore Gooroodas Banerjee. P.N. Bose, Aurobindo Ghosh, Rajendra Prasad, Raja Subodh Chandra Mullick, Radha Kumud Mukherjee and Brajendra Kishore Roychowdhury, Benoy Kumar Sarkar and others.

The magazine reported on India's achievements in the past and present, and the development of swadeshi in all its aspects, industrial, educational, social, and so on. It was generally divided into three parts. Part I entitled 'Indiana' dealt mainly with history and education. The section focused on India's manuscript libraries such as Jaina libraries, Saiva or Lingayat libraries and technical education in native Indian states like Baroda, Mysore and Travanocore State. The comments were focused on institutions and programs that included the Central Technical Institute, Kala Bhavan of Baroda, divisional industrial schools, industrial schools for artisans, schools for forest tribes, Industrial training for orphanages, and schools for practical training of the patels of Baroda State. Part II containing 'Topics for Discussion' focused on diverse aspects of national life, including politics, industry and art. Part III had two sections—'National Education Movement' and 'Students' Column'. The section 'National Education Movement' published information relating to the award of

[322] Uma Mukherjee and Harisad Mukherjee, 'Satis Mukherjee of the Dawn Society', *The Modern Review*, Jul. 1965, p. 26.
[323] Ibid., p. 26.

scholarships and free-studentships too. The essays, articles, notes, news and comments published in the *Dawn* included a wide range of issues like swadeshi, handicraft, industries and economic drain. The views of Sir Syed Ahmed Khan on Indian nation, views of James Fergusson, E.B. Havell on Indian art and architectural heritage, comments on India's literary wealth, reportings on entrepreneurship, exertions and discoveries of Dr P.C. Ray, historical essays on Gautam Buddha, Arab invasion on India, along with comments on religion, philosophy, education, and anthropology enlivened its pages.[324] Essays on science also found an important place in the *Dawn* magazine. The famous essays on science included the essay by Hridya Chandra Banerjee on Telegraphone (October 1900), physics in nineteenth century by Radhakumud Mukherjee (November 1901), and medicines in Bengal (June 1912).[325]

The prism of swadeshi as held by the *Dawn* magazine, allowed for cultural heritage along with science-based industrialism to emerge in bold relief. This was a welcome intellectual departure from the political articulation and petitioning practice of the Congress. It allowed the young generation to broaden their horizons by including many more precious and pragmatic aspects of national life.

The various activities of Dawn Society have been well documented by Dhruv Raina and Subrat Guha.[326] For Raina and Habib, the *Dawn* magazine passed through three stages: from a vehicle of dialogue and examination of Indian religions and philosophy (1897-1904) to the focus on nationalist concerns like industrialisation and education (1904-07) giving way to phase when the critique of western model of industrialisation and its support for the political-economic agenda of swadeshi (1907-13) became decisively vocal and clear.[327] In its intellectual journey and progress, the *Dawn* magazine articulated its concerns towards science, swadeshi and industrialism that fostered and shaped the agenda of national education. Writing about the progress of technical education in the native Indian states of Baroda, Mysore and Travancore, the *Dawn* reported that even these princely states were keenly alive to the question of improving the economic condition of their people by establishing engineering, industrial, commercial and agricultural schools. By instituting a

[324] *The Dawn and Dawn Society's Magazine*, vol. VII, no. 2 (Old Series), vol. I, no. II (New Series), Nov. 1904; *The Dawn and Dawn Society's Magazine*, vol. XIV, no. 1 (Old Series), vol. VII, no. 1 (New Series), Jan. 1911. *The Dawn and Dawn Society's Magazine*, vol. XIII, no. 2 (Old Series), vol. VI, no. 2 (New Series), Feb. 1910; Subrat Guha, *Rashtriyata aur Sawadeshi Andolan,* Delhi: Abhiruchi Prakashan, 1998, pp. 194-198.
[325] See Subrat Guha, *Rashtriyata aur Sawadeshi Andolan,* pp. 194-198.
[326] Dhruv Raina and S. Irfan Habib, 'The Unfolding of an Engagement', pp. 87-118; Subrat Guha, *Rashtriyata aur Sawadeshi Andolan*.
[327] Dhruv Raina and S. Irfan Habib, 'The Unfolding of an Engagement', pp. 87-118.

number of annual scholarships for students to pursue higher technical studies in India and abroad, the enlightened princely states rose to meet the challenges, though to a limited extent, of the inadequacies of technical education of the natives.[328] The magazine noted that in industrial schools the curriculum was prepared so as to stimulate the growth of home industries, handicrafts and equip artisans with some practical knowledge of machines and machinery. It also noted and welcomed similar efforts in some of the Princely states. The *Dawn* ardently argued and advocated for earnest efforts to save artisans from being turned into mere everyday wage labourers. Skill orientation and initiation of the understanding of the rudiments of science was to make the quest for Indian or swadeshi industrialism more feasible and sustainable. In this context, the magazine informed that seven industrial schools in Baroda, twenty in Mysore and fourteen in Travancore were set up and that they testify the enlightened orientation of these princely states.[329]

The *Dawn* also carried animated discussions on the subject of 'Swadeshi through Mahomedan enterprise and initiative', to counter the misconception that Mahomedan fellow-countrymen had not contributed much to the progress of the Swadeshi spirit and that they were by habits and temperament disinclined to take up technical education and industrial enterprises.[330] Arguing against the prejudicial essentialisation of the Muslim community and their relationship to trade and industry, the journal quoted Syed Ameer Ali's 'Written Greeting' to the Session of the All-India Muslim League held at Delhi on Jan. 29, 1910, where Ali reminded his Muhammadan fellow-countrymen that the evidence of their past history revealed that 'dignity of labour' was a cardinal creed of the community. As he asserted:

> Your forefathers never condemned trade, commerce or any form of industry. Kings applied themselves to learn handicraft... The greatest scholars, scientists and poets had some vocation. The Prophet himself preached constantly the dignity of labour. Why should you not look for other (industrial) avenues to means and prosperity?[331]

Through such manifest articulation, the journal tried to highlight how the pursuit of commerce and industries was being understood, indulged in and was being felt by the

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[328] 'Technical Education in Native Indian States, Part III', *The Dawn and Dawn Society's Magazine*, vol. XIII, no. 5 (Old Series), vol. VI, no. 5 (New Series), May 1910, pp. 78-84. Also see *The Dawn and Dawn Society's Magazine*, vol. XIV, no. 1 (Old Series), vol. VII, no. 1 (New Series), Jan. 1911.
[329] 'Technical Education in Native Indian States, Part III'.
[330] 'Growth of Swadeshi through Mohammedan Enterprise and Initiative', *The Dawn and Dawn Society's Magazine*, vol. XIII, no. 3 (Old Series), vol. VI, no. 3 (New Series), Mar. 1910, pp. 33-43.
[331] Ibid.

Muslim community in the then emerging context of swadeshi and industrialism. The magazine depicted the efforts by the community to demonstrate how they were pursuing 'silently and steadily the Swadeshi creed'.[332] Among such efforts, the Gujarat Islam Match-Manufacturing Company of Ahmedabad, the Berar Match-Manufacturing Company of Ellichpur, the Nawab Saheb's Oil Mill, Calcutta, Moola Mahomed's Oil Mill, Rangoon, Mahomed Bhai Jamaluddin Paper Mills, Surat, the Ice Factory, Lucknow, were noted by *Dawn*.[333] Apart from these instances, the magazine also noted that Muslims had also invested in a leather factory at Kanpur, a rolling mill, and an iron and steel factory.[334] With these examples, the *Dawn* highlighted how the pursuit of industrial swadeshi had extended beyond the limits of United Bengal and touched different parts of India as well.[335]

Interestingly, the year that saw the last edition of the *Dawn* magazine, witnessed the emergence of a new institution in the important university town of Allahabad with professed concerns and commitment to science. The *Vigyan Parishad*, Prayag or simply the Vernacular Scientific Society was set up at Allahabad to popularise the idea of swadeshi and science. It was one of the pioneering organisations or societies which periodically published its journal *Vijnana* in Hindi since April 1915.[336] *Vijnana* is credited as the first journal in Hindi that engaged with science and swadeshi and is still in publication through the grant provided by CSIR, New Delhi.[337] Today, in the high days of Big science and industrial modernity, this journal is a poor caricature of what it was and may be an unknown entity, but from the year it was initiated and for at least four decades, it served well to disseminate information, ideas and opinion about science and scientists and their quest for swadeshi. Science textbooks of school and college levels were published both by Vigyan Parishad and other agencies in Hindi, Hindustani and Urdu and were advertised through its mouthpiece *Vijnana*. Presidential addresses of eponymical scientists on the auspices of the Indian Science Congress held every year since 1914 were regularly reported and disseminated for the Hindi knowing public. Biographies of Indian scientists imbued and enthused with swadeshi ideals of claiming parity with western intellectuals were also part and parcel of *Vijnana*'s engagement with science, swadeshi and industralism, and the encouragement it provided to students pursuing science.

[332] Ibid.
[333] Ibid.
[334] Ibid.
[335] 'Swadeshi in Madras Presidency: Further Accounts of Recent Developments, Part III', *The Dawn and Dawn Society's Magazine*, vol. XIII, no. 4 (Old Series), vol. VI, no. 4 (New Series), Apr. 1910, pp. 51-59.
[336] *Vijnana,* vol. III, no. 1, Apr. 1916.
[337] B.K. Sen, 'General Scientific Societies in British India', *Indian Journal of History of Science*, vol. 52, no. 2, 2017, pp. 205-06.

The Vigyan Parishad was set up on 10 March 1913 by professors Ganganath Jha, Saligram Bhargava and Ramdas Gour, who taught Sanskrit, physics and chemistry respectively at Muir Central College, Allahabad.[338] The objective of the Vigyan Parishad was to 'popularise the scientific literature in Indian languages and to promote the study of science and scientific discoveries' among the masses.[339] The society consisted of a council of 'gentlemen' including president, vice-president, prime minister!, editors and an internal committee to attend to its affairs. The members of the council were required to pay Rs 6 as annual contribution. During 1915-16, the first year of the *Vijnana's* publication, the members of its council were prominent personalities from Allahabad and other regions including Dr Sunderlal Raibahadur as President, Dr Ganganath Jha, Madan Mohan Malaviya, Annie Besant, S.H. Fremantle (the collector of Allahabad), King Rampal Singh (Raibareli) and Purohit Gopinath (Member State Council, Jaipur) as Vice-President. Many teachers from neighbouring areas with higher educational degrees served the magazine in various capacities.[340] The initial editorial assistance to the journal was provided by Lala Sitaram, Shridhar Pathak and Gopal Swarup Verma. Due to lack of proper funding in the initial year no remuneration was given and Lala Karamchand shouldered the cost of publication. However, after the first year of publication the council of the society took care of the publication cost.[341]

The *Vijnana's* title page described the journal as the 'Hindi organ of the Vernacular Scientific Society, Allahabad', and in the early years, its opening page usually began with a *manglacharan* (prayer) or a set of Sanskrit shlokas espousing and extolling scientific, moral, ethical and rational values.[342] The invocation of the almighty to make its pursuit of science possible and fruitful was part of the journal's moral and rational worldview. The *Vijnana's* editors invoked the almighty with great gratitude to constantly redeem their pledge of sincerity to ardently pursue science. The journal's articles lucidly covered a wide range of subjects and did not directly present hard core science in the disciplinarian sense. The aim was to draw attention to the industrial utilities that various science disciplines offered so as to

[338] *Vijnana*, vol. XI, no. 1, Apr. 1920, p. 1. Also see S.G. Mishra (ed.), *Hindi mein Vigyan Lekhan ke Sau Varsh*, vol. 1 & 2.
[339] . Ibid. Also see S.G. Mishra (ed.), *Hindi mein Vigyan Lekhan ke Sau Varsh*, vol. 1, p. xv.
[340] The name of teachers included the likes of Satish Chandra Dev, Gopal Swarup Bhargava, Mohammad Ali Nami, Brajraj, Ramdas Gaud, Devendranath Pal, Saligram Bhargava, Shyamsunder Das. *Vijnana*, vol. III, no. 1, Apr. 1916. Also see all issues of 1916.
[341] *Vijnana*, vol. III, no. 1, Apr. 1916, pp. 1-2. The other issues of 1916 also reiterated the financial difficulties of the journal and the financial assistance provided by Lala Karamchand.
[342] Ibid., pp. 1-2.

encourage Indians to appreciate the potential of those utilities. Articles were written on a range of topics such as tarapine and biroja, food and vitamins, iron pillar of Delhi, arithmetic, homeopathy, description of scientists of the Royal Society, plague, hygiene, light, agriculture, god and science, power, printing, paintings, the history of England, politics and others.[343] The journal also provided space to incorporate views of readers, excerpts from essays and reviews of other magazines, advertisements about the publication and sale of popular Hindi books[344] on science, and in the same vein it also publicised information about Swadeshi industries, extolling and emphasising their virtues in negotiating modernity.

For instance, one finds *Vijnana* highlighting a short review published by an important contemporary journal *Modern Review* about the book *Chumbak* (Magnet), authored by Prof Saligram Bhargava, who was also one of the founders of the Vigyan Parishad. The fourth volume in the science series, *Chumbak* dealt with the subject of magnet and magnetism and was divided into thirteen sections including an appendix.[345] The *Modern Review* commented favourably on the clarity and lucidity of this Hindi treatise on magnetism that it hoped would benefit students. Similarly, the *Vijnana* published a letter of appreciation from Tikam Sahay, an Assistant Station Master at Haridwar who through the magazine expressed his gratitude to Vaidyaraj Pt. Ramchandraji Saheb for his medical advice that helped him overcome a urinal disorder.[346]

Within three years of its publication, the journal became very popular and the Director of Public Instruction, United Provinces and Central Provinces approved its use in schools and colleges.[347] On completion of five fruitful years of the *Vijnana's* publication, the editor Prof Gopalswarup Sahay 'prayed to the lovers of swadeshi and Hindi language' that they should 'promote science with their work, mind and wealth so that India did not remain backward in scientific perspective'.[348] On this occasion, the journal once again committed itself to the cause of promoting science, swadeshi and industrialism through its forthcoming issues.

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[343] *Vijnana*, vol. III, no. 1, Apr. 1916; *Vijnana*, vol. V, no. 1, Apr. 1917; *Vijnana*, vol. IX, no. 1, Apr. 1919; *Vijnana*, vol. XI, Apr.1920; *Vijnana,* vol. XV, Apr.-Sept. 1922.

[344] The books were on magnetics (*Chumbak* by Saligram Bhargava); Organic Chemistry (*Karbanik Rasayan* by Satyaprakash), Scientific Standard (*Vagyanik Pariman* by Dr Nihalkaran Sethi). The advertisement included books published by Vigyan Parishad, Ganga Pustakmala and of other publishers.

[345] *Vijnana*, vol. IX, no. 1, Apr.-Sept. 1919, p. 6.

[346] Ibid , p. 2.

[347] *Vijnana,* vol. IX, no. 1, Apr. 1919. In its early days, the magazine received articles from noted intellectuals like Prof Nihalkaran Sethi (1893-1969) Prof of Physics at Banaras Hindu University, Varanasi, and Prof Lala Bhagwandin (1866-1930) Professor of Hindi at Banaras Hindu University, Varanasi.

[348] *Vijnana,* vol. IX, no. 1, Apr. 1920.

The *Modern Review,* founded by Ramananda Chatterjee in 1907 at Calcutta, was another important forum of the Indian nationalist intelligentsia which also began to reflect views and concerns about science and swadeshi.[349] It had a wide canvass and commented upon a plethora of themes ranging from the changing contours of international and national politics, anthropological aspects of India, and contemporary understanding of aspects of India's urban social setting and scenario. It critiqued and commented on contemporary trends in art, analysed Indian heritage and history, discussed the evolution of religion and its changing impact, kept an eye on economic analyses in the context of international and national policies, and presented reviews of a large number of books on a wide array of themes. Needless to say, science, scientists, swadeshi, self-reliance, planning and incisive and insightful comments about the evolution of higher education and academic community in India found ample space and serious consideration within the pages of the *Modern Review*. In a comprehensive sense, the magazine did mirror India's quest for modernity.

The *Modern Review* was printed at the Indian Press, Allahabad and carried essays on politics, economy, society, education, art as well as published poems, stories, travelogues and sketches to shape and carry forward the idea of swadeshi. Its very first volume published articles of leading intellectuals: G. Subramania Iyer wrote on India's industrial future, Sister Nivedita on the role of art in shaping nationality, K.R. Kirtikar on study of natural science in Indian universities, G.V. Joshi on industrial problem, E.B. Havell on Indian handloom industry, and it also carried translations of Sivaji's letters by Jadunath Sarkar.[350] In its later editions, the magazine published Radhakamal Mukerjee's pioneering essays on environmental degradation, essays by Jawaharlal Nehru under the pseudonym 'Chanakya'—an example of Nehru's own essay in an autocritiqued form titled '*Rashtrapati*' in November 1937, and many other such serious and polemical writings.

The *Modern Review* in its July 1921 issue discussed the teaching of botany, uses of microscopes by students, the best collection of books in physics, chemistry, botany, psychology, agriculture and up-to-date scientific journals at the institute at Adyar established by Annie Besant in 1918, which was considered in contemporary times a National Univerrsity with Rabindranath Tagore as its Chancellor.[351] Noting the importance of the

[349] Anikendra Sen, Devangshu Datta and Nilanjana Roy (eds.), *Patriots, Poets and Prisoners: Selections from Ramananda Chatterjee's The Modern Review, 1907-1947*, Delhi: HarperCollins, 2016; Gopal Haldar, 'Ramananda Chatterjee: A Great Editor', *Indian Literature*, vol. 8, no. 2, 1965, pp. 5-11.
[350] *Modern Review*, vol. I, no. I-VI, Jun. 1907.
[351] *Modern Review*, vol. XXX, no. 1, Jul. 1921.

application of science in manufacturing, the magazine underscored how the untiring labour of chemists had catapulted the sugar-cane industry of Java into a model for the world to emulate, and that India too should inculcate and imbibe the spirit and technique of applied science in sugar manufacturing from Java.[352] In a similar vein and context, the journal reported about the importance of the technical school for training apprentices at Tata Iron and Steel Company, Jamshedpur.[353] Many such inspiring events and episodes related to science, swadeshi and industrialism were part and parcel of the *Modern Review's* thrust and concerns.

Another influential journal, the *Hindustan Review* founded in 1905 by Sachidananda Sinha, and later led by K.C. Mahindra, published from Allahabad, also focused on the importance of science and technical education in India's progress.[354] Mushir Hasan Kidwai in his article on Swadeshism refuted the perception that Indian Musalamans were anti-swadeshi and argued that Muslim Julahas stood to benefit from the swadeshi spirit. Kidwai pointed out that associations and stores needed to be open in smaller towns to 'popularize India made things, to bring them within the easy reach of the people, to procure new designs and new inventions, to advertise indigenous goods and to help Indian workmen, artizans and manufacturers.'[355] Further, Kidwai argued that 'Europe dominate[d] over Asia through its materialism, commercial activities, industrial development, scientific inventions and organising power. Swadeshism would bring all these things to Asia also.'[356]

The *Hindustan Review* in its advertisements gave ample space to Indian swadeshi industries too. In its issue of July 1911, it put up a detailed advertisement requesting the public to invest in Indian banks, such as Oudh Commercial Bank, Allahabad Bank, The Kayastha Trading and Banking Corporation, respectively led by Rai Ram Saran Das, H. Vost and H. Garib.[357] Through the *Hindustan Review* and providing a nationalist touch to its advertisements, the National Insurance Company based in Canning Street, Calcutta, implored Indians to insure and invest in it as 'it is a purely Indian Company'.[358] The journal also provided space to advertisements of products of medicinal value like the 'Rose Carbolic Tooth Powder' of N.S. Murty and Company, Cocanada. In another advertisement, Raj

[352] *Modern Review*, vol. XXX, no. 2, Aug.1921.
[353] *Modern Review,* vol. XXX, no. 3, Sept. 1921.
[354] *The Hindustan Review,* vol. XXII, no. 133, Sept. 1910; *The Hindustan Review*, vol. XXIX, no. 164, Feb. 1916.
[355] *The Hindustan Review,* vol. XVIII, no. 110, Oct. 1908, pp. 339-341.
[356] Ibid.
[357] See 'Advertisement', in *The Hindustan Review*, vol. XXIV, no. 143, Jul. 1911.
[358] Ibid.

Vaidya Narayanji Keshavji advocated his treatise *Vaidya Vidya* as a guide to health, wealth and happiness. As he wrote: '[T]his is an interesting and instructive medical treatise dealing with the secrets of sound health, pure enjoyment and long life. It elaborately mentions how man unknowingly destroys his health by youthful errors and points out the efficacious ways to recoup the same.'[359]

The *Review* also frequently brought out advertisements of products like Sulemani salt, writing pen, Nervine Tonic pills, the popular Indian balm—Amrutanjan, and Keshranjan oil.[360] Another popularly advertised pharmaceutical product was *Arshahara Batika*, a pill useful in distressing disease prepared by Kaviraj Nagendra Nath Sen who curiously along with the product also flaunted his membership of European profession bodies like the Society of Chemical Industry (London), Surgical Aid Society (London), Chemical Society (Paris), and Chemical Society (America). Besides advertisements, the *Hindustan Review* also included articles on vaccination and small-pox, hygiene and diseases of India, aviation in ancient Hindustan, the Tercentenary of Francis Bacon and also questioned the examination and crammer-based western education.[361]

Towards National Education

An attempt to establish institutes for national education, outside the pale of the state system of education, was initiated by Indian nationalists with the dawn of the twentieth century. Among such institutes, Gurukul Kangri Vishwavidalaya (1902), Shanti Niketan (1902), Jamia Millia Islamia (1920), Kashi Vidyapith (1921), Tilak Maharashtra Vidyapith (1921) and Bihar Vidyapith (1921) were prominent. These academic institutions established amidst the Swadeshi, Home Rule and Non-cooperation Movement carried to fruition the ideas of Satish Chandra Mukherjee, Aurobindo Ghosh, Madan Mohan Malaviya, Lala Lajpat Rai, Tagore and Gandhi. However, the historiography on education in the post-independence era is largely silent about these institutions.[362]

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[359] See 'Advertisement', in *The Hindustan Review*, vol. XXIV, no. 143, Jul. 1911.
[360] Ibid.
[361] *The Hindustan Review,* vol. XVIII, no. 110, Oct. 1908, pp. 349-355; *The Hindustan Review*, vol. XXIV, no. 146-147, Oct.-Nov. 1911, pp. 323-325; 429-432; 440-443. *The Hindustan Review*, vol. XXIX, no. 176, Apr. 1915, pp. 370-375; *The Hindustan Review*, Jul. 1926, pp. 370-375
[362] See S. Nurullah and J.P. Naik, *A History of Indian Education,* New Delhi: Macmillan, 1974; Aparna Basu, *Essays in the History of Indian Education,* New Delhi: Concept, 1982; and S.C. Ghosh, *The History of Education in Modern India: 1757–2007*, New Delhi: Orient BlackSwan, 2010. For an alternative view on these native national institutions see Kanhaiyalal, *Rashatriya Shiksha ka Itihas aur uski Vartaman Avastha*, Kashi: Kashi Vidyapeeth, 1929.

In examining the evolution of the national education experiment in the twentieth century, the points of disenchantment and departures with the earlier unfoldment of educational reform in the nineteenth century need to be brought to the fore. The Macaulian thrust on English education and the enchantment with western enlightenment that had overawed nineteenth century Indian reformers and intellectuals gradually paved the way for a more critical and nuanced understanding of education for Indians and by Indians. By the end of the nineteenth century, a generation of thinkers and intellectuals began to think afresh about education and began to chart out a different path that led them to forge and float a new agenda for national education at the beginning of the twentieth century.[363] As already discussed in an earlier section, the *Dawn* magazine emerged as a new forum of expressing this new aspiration. The literati and intellectuals who contributed in this new aspiration through the *Dawn* magazine and other forums, later constituted themselves into a group which became the Dawn Society and which indulged in the experiment of new education. Aurobindo who had urged for lighting of new lamps a decade earlier in the political arena, now stood beside Satish Chandra Mukherjee and others to light new lamps in the realm of culture in general and national education in particular. It is instructive to note that all these intellectuals who coalesced to form the Dawn Society with the exception of Rabindranath, were themselves products of the western colonial education system. And while they did not out rightly reject western education per se, the need for an alternative system and a bolstering of Indian knowledge systems was increasingly felt.

As part of the cultural articulation of the Swadeshi movement, the idea of national education began to take concrete shape through the various national institutions that were established in the initial decades of the twentieth century. One of the most ardent proponents of national education, Lajpat Rai defined it as an aspiration and a process that 'must be controlled by Indians, shaped by Indians, carried on by Indians. It must hold up Indian ideals of devotion, wisdom and morality, and must be permeated by the Indian religions spirit rather than fed on the letter of the creeds.'[364] These nationalist institutes were based on the idea of providing 'an education as comprehensive as the European without the evils of strain and cramming'.[365] At these institutions, teachers worked as helpers and guides rather than as instructors or taskmasters. They functioned independent of government patronage, tried to

[363] P.K. Mukhopadhayay, 'The Fourth Great Movement of Indian Renaissance', Dr C.D. Deshmukh Memorial Lecture delivered at the India International Centre, New Delhi on 14 Jan 2014, IIC Occasional Publication no. 57, 2014.
[364] Lala Lajpat Rai, *The Problem of National Education in India*, London: George Allen, 1920, pp. 28-29.
[365] Aurobindo Ghose, *A System of National Education*, Sri Aurobindo Ashram, 1970, pp. 2-3.

bridge the gulf between the educated and uneducated masses, and focused on the necessity of technical education in arts and industries, that would make the future young generation of the country independent of state service.[366]

Nevertheless, these newly emerging universities faced several difficulties, as they existed outside the pale of the state, which did not recognise their degrees either. In fact, the colonial government was non-cooperative and this is evident from the fact that these institutions, even those among them that had acquired definite shape, were not included in the list of commonwealth universities as late as 1939.[367] However, they did figure in the Inter-University Board of the Government of India.[368] Some leaders like Madan Mohan Malaviya had foreseen this problem when he was trying to give shape to the idea of Banaras Hindu University. He was astute enough to have realised that this isolation would defeat the purpose of national education so the Hindu University Society under his leadership took the procedural consent of the government to establish the Banaras Hindu University. Under the duress of the colonial government, Malaviya changed or diluted his stance on the medium of instruction for his proposed university at Banaras. He wanted to provide higher education at his proposed university in Hindi. The colonial government disagreed and so Malaviya, in order to realise the creation of the national university and to ensure that the colonial government recognised the university and its degrees, complied with the latter's desire in this regard and changed his stance. This is amply evident from the different prospectuses of BHU issued at different points in time before its final foundation.[369]

This is only one part of the story. The other part can be understood by what was practiced by BHU in its initial decades. Under the BHU Granth Mala series and various such series, the university with the help of its faculties, particularly the science faculties, rendered fresh textbooks on scientific subjects in Hindi and also created dictionaries and compendiums of scientific and technical terms to aid the dissemination of science, mathematics and medicine in Hindi. Hence what Malaviya appeared to have diluted and lost as was revealed in his changing stance in the various early prospectuses of the proposed university, was actually retrieved and redeemed in practice once the university came into being. As examined earlier,

[366] Lala Lajpat Rai, *The Problem of National Education in India*, London: George Allen, 1920, p. 20.
[367] *The Yearbook of the University of the Empire 1939*, London: The Universities Bureau of the British Empire, 1939.
[368] *Handbook of Indian Universities*, Bangalore City: Inter University Board, 1928; Sir H. Frank Heath, *The Yearbook of the University of the Empire 1932*, London: The Universities Bureau of the British Empire, 1932.
[369] S.L. Dar and S. Somaskandan, *History of the Banaras Hindu University*, 1966; Varanasi: Banaras Hindu University, 2007 (2nd rpt).

a plethora of books and tracts on sciences in Hindi authored by BHU faculty members like Nihalkaran Sethi and Phuldeo Sahay Varma stand testimony to the university's role in facilitating science dissemination in the vernacular. Amidst various constraints, the focus on scientific, technical education and industrial research remained one of the essential aspects of national education. As Lajpat Rai asserted, '[N]ational education must live in an atmosphere of...Indian triumphs in science. The Arthashastra must be studied as well as...science.'[370] Subsequently, national education was to help in implementing the progress of science to the factory that had not yet taken place in India.[371]

In this context**,** Gurukula Kangri Vishwavidyalaya, founded on March 4, 1902 by Arya Samaj leader Swami Shraddhananda**,** tried to provide an indigenous alternative to the colonial education policy by imparting education in the areas of Vedic literature, Indian philosophy, culture, modern sciences and research.[372] With the idea and aim of dispersing the knowledge of science, the institute in its early decades appointed erudite teachers like Mahesh Charan Sinha who propogated knowledge of physics, chemistry and botany in Hindi. The institute through its museum preserved the physical remains of two German canons known as Emadon, fired during the First World War at the Madras harbour. The same year, some specimens of marine objects presented to Swami Shraddhananda by his close friends A.T. Brooke and C.F. Andrews, were also acquired by the museum. In 1911, a telephone model was donated to the museum, prepared by students of Gurukula under the supervision of Prof Mahesh Charan Sinha. In 1914, Vinayak Ganesh Sathe translated a book on evolutionism. William S. Ferno's book on chemistry was also translated by Govardhanji of Gurukul.

Amidst the Swadeshi movement in Bengal, a National Council of Education (NCE) was formed by Bipin Chandra Pal, C.R. Das, P. Mitra and others. A Society for the Promotion of Technical Education (SPTE) was also set up by Tarak Nath Palit, P.N. Bose, and Dr Nil Ratan Sarkar, while Aurobindo Ghose and others mentored the Bengal National College (BNC), a sister organisation. The SPTE went on to set up the Bengal Technical

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[370] Lala Lajpat Rai, *The Problem of National Education in India*, London: George Allen, 1920, p. 29. Further 'The civilization we developed was noble, lofty and great. Our achievements in religion, philosophy, law, sociology, sciences and arts are worthy of being compared with the best of the old world. They do not sink into insignificance even when compared with the best of the modern world. We have no reason to be ashamed of our past.' *Ibid*. 72

[371] Lala Lajpat Rai, *The Problem of National Education in India*, London: George Allen, 1920, pp. 200-202.

[372] For a brief history of the university since its foundation, see *Gurukul Kangri Visvavidhalaya ka Sanshipt Itihas, 1901-1930*, Haridwar: Prakashan Mandir.

Institute (BTI) while the NCE established the Bengal National College. The BTI developed into the College of Engineering and Technology at Jadavpur in independent India, but in the early decades of the twentieth century, it focused on enabling students towards independent careers in the field of crafts and industry.[373] Similarly, the BNC also provided training in both theoretical and practical aspects of technical learning. Exhibitions were organised in January 1908, March 1909 and February 1910 by the college where articles produced by the workshop were displayed to encourage students and common people towards country made products.[374] The NCE also received the support of Bal Gangadhar Tilak and Lala Lajpat Rai.[375]

An important Indian endeavour to institutionalise science was initaited and realised by Sir J.C. Bose with the founding of the Bose Research Institute in 1917 at Calcutta.[376] In order to establish his institute, Bose had requested for both procedural and pecuniary support from the colonial government. Bose's career and struggle from his days at IACS to his teaching career at Presidency College, his protest against pecuniary disparities between Indians and Europeans, and his struggle to acquire recognition and acclaim at European centres of science provided strength to his claim to parity in the domain of science, then an European hegemonic arena. Similarly, Bose's invocation of Indian cultural metaphors to communicate his science and also his use of mother tongue in his dialogue with the literati made him an iconic figure in the era of swadeshi. So much so that the science institute or the 'Basu Mandir' founded by him was construed to be a swadeshi institution and enterprise.

In the southern part of India, the Indian Institute of Science in Bangalore popularly known as the Tata institute was formally established in 1909 with the issuance of the vesting order of the Government of India. The institute owed its origin to the imagination of J.N. Tata, whose plan for establishing a research institute was brought to fruition after his death

[373] Nirmala Shah, 'Techno-Scientific Education and the Indian National Congress (1885-1918)', *Indian Journal of History of Science*, vol. 49, no. 3, 2014, pp. 278-92.
[374] Ibid.
[375] Ibid.
[376] Apart from J.C. Bose, the initial staff at the institute consisted of Prof Nagendra C. Nag, Abani Nath Mitter, Manager, Dr Guru Prasanna Das, Instructor in Physiology, Surendra Chandra Das, Instructor in Physics, Dr Khirod C. Mazumdar, Research Associate, and Dr Jyoti P. Sircar, who was in charge of investigations in practical medicine. The Bose Institute worked in the field of responses in the living and non-living, comparative electro-physiology, irritability of plants, physiology of photosynthesis and nervous mechanism in plants. Investigations on the physiological mechanism of simple vegetable life had led to the better understanding of the more complex mechanism of animal life. See *Handbook of Indian Universities*, Bangalore City: Inter University Board, 1928, pp. 388-90.

by the far-sighted generosity of his two sons, Sir Dorabji Tata and Ratanji Tata. The institute began functioning in July 1911, and its laboratories provided facilities for post-graduate work in four main branches of science, namely, general chemistry, organic chemistry, bio-chemistry and electrical technology.[377] Chemistry was an important discipline that was nurtured in the initial days at IISc. On the strength of its chemistry department along with the evolution of other science and technology departments in due course, the institute played a decisive role in the industrialisation of the princely state of Mysore. It provided consultancy to other provincial governments as well, but with Mysore, it was a more intense, protracted and productive engagement.[378] These serious and sustained efforts fostered the swadeshi industrialism that was taking shape. These institutes in the arena of science and industry helped to reinforce the initiatives began by Mahendralal Sarkar's India Association for the Cultivation of Science (1876) and P.C. Ray's Bengal Chemicals (1893).

The impact of the ideals of swadeshi is explicit and evident in the articulation of various interlocutors from different realms and profession. In fact, political leaders like Madan Mohan Malaviya and scientists like P.C. Ray emphasised the compatible and reinforcing industrial potential of coupling science and swadeshi. P.C. Ray also hinted at the potential for such science-based industrialism to foster employment and entrepreneurship.[379] One can see the threads of Mahendralal Sarkar's thoughts and actions being retrieved, refined but being presented and argued in the context of new industrialism and production oriented discussion on swadeshi and self-reliance. The Dawn Society magazine as a forum was highly articulate in this regard.

Malaviya's exertion to establish a residential university with special emphasis on science stands testimony to this.[380] The Maharaja of Mysore in his first convocation address as Chancellor of the Banaras Hindu University in 1919 had broadly rearticulated Mahendralal Sarkar's vision by underlining the newly established university's aspirations and challenges

[377] Dr Morris Williams Travers was appointed as the first Director of the Institute. Other faculty included Prof H.E. Watson, Prof R.V. Norris, and Prof J.K. Catterson-Smith. Among Indians, S.K. Kulkarni Jatkar, Dr G.C. Chakravarti, Subrahmanyan, and T.J. Mirchandani were appointed as faculty. *Handbook of Indian Universities*, Bangalore City: Inter University Board, 1928, pp. 393-94.

[378] For a discussion on this aspect and details of the genesis and evolution of IISc, see B.V. Subbarayappa, *In Pursuit of Excellence: A History of the Indian Institute of Science*, New Delhi: Tata McGraw Hill Publishing Company, 1992. Also see P. Balram, 'The Indian Institute of Science: Reflections on a Century', *Current Science*, vol. 96, no. 10, 2009, pp. 1404-11.

[379] P.C. Ray, *Essays and Discourses*, With a Biographical Sketch & A Portrait, Madras: G.A. Natesan & Co., 1918 (1st edn.).

[380] Madan Mohan Malaviya, *The Hindu University of Benaras: Why it is Wanted? And What it Aims At?* Allahabad: Printed by Panch Kory Mittra at the Indian Press, 1909.

and the need to impart an open character to it from the time of its inception.[381] In continuity with the activities and spirit of the IACS and the NCE, the new articulated aspiration to establish residential universities through indigenous efforts where teaching and research could coexist, fostered and strengthened industrialism. The inspiration and impact of the spirit of swadeshi and industrialism on J.N. Tata's vision of science and technology in India,[382] along with Asutosh Mukherjee's role in converting the Calcutta University into an institution akin to a Humboldtian University became exemplars of organising science teaching and research for other institutions in the 1920s and 30s. Through Mukherjee's efforts, C.V. Raman joined as Palit Professor at Calcutta University to lead its Science Department and the lessons he learnt at IACS helped him in building its firm foundation. Mukherjee was able to innovatively transcend the Curzonian frame and imparted science research a dynamism of its own within the university framework. As a teacher and researcher of mathematics at IACS, he remained in personal contact with many young and aspiring students of science and mathematics and, as an influential Vice Chancellor and a legal luminary, he arranged for their higher studies abroad and persuaded them to join the Science Department at Calcutta University.[383] Besides C.V. Raman, M.N. Saha and S.N. Bose were the other initial beneficiaries of Asutosh Mukherjee's reorganisation of science teaching and research at the Calcutta University. Mukherjee was also instrumental in the formation of the Indian Science Congress Association (ISCA) in 1914. Beginning with a membership of 60 scientists in 1914, the ISCA soon expanded to 300 members in 1916 and 360 members in 1920, increasingly becoming articulate and assertive about the role of scientists as a community—not only in the dissemination, application, administration and control of matters pertaining to science but also in addressing wider national problems.[384]

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[381] *BHU Convocation Addresses*, 17th Jan., 1919 by (Maharaja of Mysore) the Chancellor of the university and Sir P.S. Sivaswamy Iyer (the Vice-chancellor of the University), Varanasi: Banaras Hindu University, pp.5-6.

[382] J. N. Tata stated three basic ingredients for industrialisation and self-reliance: 'Steel was the mother of heavy industry. Hydro-electric power the cheapest energy to be generated, and technical education coupled with research was essential for industrial advance.' See R.M. Lala, *The Creation of Wealth*, Bombay: IBH Publishing & Co., 1981, p. 6; see also the first four chapters. TISCO at Jamshedpur (1907), The Tata Hydro-Electric Power Supply Company at Bombay (1910), and the Indian Institute of Science at Bangalore (1911) stand as testimony to his efforts, understanding, and entrepreneurial acumen.

[383] Aspects of interconnected history of BHU, AMU, Calcutta University and Indian Institute of Science provides further strength and depth to the idea of science, swadeshi and industrialism.

[384] The Indian Science Congress Association (ISCA) was instrumental in organising the scientific community that increasingly came to terms with nationalist political policy makers. The National Planning Committee (NPC, 1938) conceded a considerable role of leadership to the nationalist scientists in formulating and charting out a long-term agenda of national growth and regeneration. See *The Shaping of Indian Science: Indian Science Congress Association Presidential Addresses,* 3 vols, Hyderabad: Universities Press (India) Private Limited, 2003. Also see Sneha Sinha, 'Role of Indian Science Congress Association, 1914-1947', *Indian Journal of History of Science*, vol. 53, no. 4, 2018, pp. T217-T222.

The idea of self-reliance was as forcefully articulated by nationalists like Malaviya and by the savants of science like P.C. Ray. Nationalists who critiqued the Raj's political and economic imperatives argued and advocated the marriage of science, industrialism and self-reliance and thus imparted more substantive meaning to nationalism.[385] Though Swadeshi could not continue as a movement for long, its legacies in different realms and with varying shades were enduring. Consequently, National Education also had many shades. Many famous luminaries of Indian science like C.V. Raman and S.P. Agarkar, who after the 1930s, spearheaded one institution or the other, had spent the formative and youthful years of their life in the swadeshi ethos. J.N. Mukherjee, J.C. Ghose, Nil Ratan Sircar and Nil Ratan Dhar were also nurtured in the swadeshi ethos. It is not incidental that M.N. Saha, P.C. Mahalanobis and S.N. Bose who were born in almost the same year started their career in physics and, except for Bose who remained in basic sciences, one went on to become a science organiser and administrator par excellence, and the other a planner par excellence.

The foundational debates and discussion pertaining to the idea of an Indian university also underlines the contribution of the house of Tatas towards higher education in India. J.N. Tata's industrialism, nationalist aspiration and his understanding of the contradictions of the colonial system of higher education propelled him towards a vision of a full teaching and research university. Science and industrialism were important components of his vision. In the then prevailing constrained colonial context, Tata initiated and created endowments for supporting and nurturing talents by providing them scholarships to study abroad for acquiring higher professional competence. This was the beginning of Tata's engagement with higher education in India. He soon realised that he needed to create a more enduring foundation with long-term vision, and so was keen on the establishment of a full-fledged university where the best could be catapulted as future leaders. However, due to colonial constraints and impediments, Tata's notion of creative and constructive philanthropy to create and support a university of excellence was watered down by Curzonian intervention and what emerged after protracted discussions with the colonial government was a much-truncated institution at Bangalore called the Indian Institute of Sciences.

[385] *Report of the Industrial Commission (1916)* with 'Malviya's Dissent Note' can be regarded as the certificate of the abovementioned marriage.

Swadeshi Spirit and Indian Industrialism

The spirit of swadeshi brought about a significant revival in handloom, silk weaving, crafts, native medicine and other aspects. The advertisements of this era, i.e. the early decades of the twentieth century articulate the spirit of science and swadeshi. This spirit of swadeshi was also being continuously reinforced by the constant critique of colonialism presented in the various vernacular newspapers and magazines. Writings of Sakharam Ganesh Deuskar in Bengal and columns of *Abhyuday* initiated under the leadership of Malaviya, and later on carried forward under the editorship of P.K. Malaviya stand testimony to the proliferating spirit of swadeshi.[386] So much so that, by 1930s, one witnesses the compilation of swadeshi enterprises and industries being published as Swadeshi Directories.

The seeds of these educational and industrial concerns and efforts can also be seen in the writings and initiatives of nationalist-scientist-intellectuals like Acharya P.C. Ray. The Acharya was one of the leading voices articulating the problem of educated unemployment among Indian youth and the propagation of small-scale swadeshi industrialism as a long-term remedy for the pervasive phenomenon of unemployment. In his creative and constructive critique of colonialism, his chemistry of salt, mercury, and many more elements found in natural abundance in India were to play a significant role in swadeshi industrialism. The Acharya understood the efficacy of high and heavy industrialism with sophisticated and high skills but was also predisposed to the Gandhian truth of decentralised, indigenous small-scale commodity production based on naturally found resources and its cumulative capacity to change the unemployment scenario and also its capacity to enhance the standards of healthy living. Through his practical engagement with chemistry, he invited young students to initiate the production of soap, detergents, agarbatti, candles, paper, simple medicinal formulations, and such everyday necessities of lived modernity.

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[386] Sakharam Ganesh Deuskar, *Desh Kee Baat*, trans. by Baburav Vishnu Pararkar, Introduction by Manager Pandey, Delhi: National Book Trust, 2005.
In 1904, the writings of Sakharam Ganesh Deuskar in Bengali/ Bangla were compiled into a book titled *Desher Katha*. Subsequently, it was translated into Hindi and published in 1907 and 1908 from Bombay. It was published from Calcutta in 1910. The book was a trenchant critique of colonialism and in the aftermath of the Swadeshi movement, strengthened the spirit of swadeshi enterprises. By 1910, the book had undergone many editions. The popular reception of the book compelled the British to ban it by 1910. It was really unfortunate, that such a keen observer and critic of contemporary scenario Sakharam Ganesh Deuskar died a premature death in 1912.
The Centre for Social Studies CSSS, Kolkata has commemorated the spirit of this organic intellect by instituting a prestigious lecture in his memory called Sakharam Ganesh Deuskar Lectures. It is a singular honour for a social scientist to be invited to pay tributes to him.

Table 3.2: Statement of Sales at Bengal Chemicals

Year	Rs.
1901-02	25,371
1902-03	34,423
1903-04	41,584
1904-05	62,319
1905-06	83,854
1906-07	1,19,321
1907-08	1,71,225
1908-09	2,31,729
1909-10	2,62,654

Source: Amit Bhattacharya, *Swadeshi Enterprise in Bengal, 1900-1920,* Calcutta: INA Press, 1986, pp. 81-82.

Aspects of swadeshi enterprises in Bengal has been extensively probed and researched by Amit Bhattacharyya.[387] The swadeshi enterprises included a broad spectrum of products, processes and commodities like textile, chemicals, leather, shipping tobacco, pen, nib, pencil, pottery and other miscellaneous commodities. As Bhattacharyya highlighted, from 1898 onwards, the *Dawn* warned against the uncritical transplantation of western industrialism. In fact, Satish Chandra Mukherjee focused on craft and small-scale industry and noted that high or big capitalist organisations should invest only in such big and indispensable industries like railway, mines and chemicals.[388] The swadeshi movement and spirit brought the revival of small-scale industry. J.G. Cumming in his report pointed out that by 1906-07, the weaving industry had recovered from its decline, as evident in the Arambagh sub-division of the Hooghly district, where the number of manufacturers rose from 11 lakhs to 14 lakhs. [389] Similarly, the *Quinquennial Administration Report of the Presidency Division from 1905-06 to 1909-10* on hand weaving industry revealed how the Swadeshi movement had improved the industry. The Swadeshi movement not only bolstered the weaving industry but the production of hosiery goods as well. The Oriental Hosiery Manufacturing Company, established by Akhil Chandra Mukhopadhyay in 1893, manufactured thread, wool, silk, and other items. [390] In 1907 solicitor Bhupendra Nath Bose bought this company and it came to be known as Bengal Hosiery Limited. The Behar Knitting Factory established at Patna had a market in Calcutta too. The Pabna Silpa Sanjibani Co., founded by a landlord of Pabna, Taran

[387] Amit Bhattacharyya, *Swadeshi Enterprise in Bengal, 1900-1920,* Calcutta: INA Press, 1986.
[388] Ibid., p. 8.
[389] Ibid., p. 12.
[390] Ibid., p. 19

Gobina Chaudhuri, was registered in 1906 and produced vests, socks, sweaters and other items.

Based on advertisements in the journal *Capital*, Bhattacharyya found that many industries producing allopathic medicines were established. Companies like British Chemical Works set up in Calcutta importing allopathic medicine also dealt with indigenous drugs. It was by and large an indigenous firm with British connections.[391] Along with allopathic drugs, homeopathic drugs also started pouring into Bengal and other parts of India from America, Britain, Germany and Italy. King and Company sold American drugs of different types. It was patronised by well-known physicists like Dr Yunan, Dr Roy, Dr Chandra Sekhar Ali and others.[392] Ayurvedic works in Bengal included Haram Ayurvedic Aushsdhalay (1865), Ayurveda Mahamandal Co. (1919). In 1912, the Ayurveda Sabha was formed in Calcutta with Bijoyratna Sen as its president and Gananath Sen as secretary. Mathura Mohan Chakravarti, the Head Master of a High School in Dacca, established the Sakti Aushadhalay in 1901.[393]

Notable contribution to revive ayurvedic medicine was also made by Jogesh Chandra Ghosh, the founder proprietor of the Sadhana Aushdhayalaya (1914). J.C. Ghosh was a lecturer in chemistry at Bhagalpur College and student of P.C. Ray.[394] While ayurvedic firms competed with allopathic medicines in the Indian market, none of them carried out open propaganda against allopathic medicines. Their propaganda through advertisements in newspapers and journals supported the regeneration of ayurvedic medicines but did not advocate the boycott of British drugs. Bhattacharyya has portrayed how the Swadeshi movement led to the regeneration and revival of ayurvedic medicines. During the course of the movement, it was also realised that the revival of Indian medicines should take into account western chemical improvements as well and that both eastern and the western sciences should be utilised for the benefit of people. Both the old and the new—the swadeshi ayurvedic and the swadeshi allopathic—formed integral parts of a united challenge against foreign competition.

Apart from Bhattacharyya's recent researches, a commentator of the 1920s, K.V. Ganapathy Iyer through his book on Indian Industrialism, tried to look at India's

[391] Ibid., p. 57.
[392] Ibid., p. 57
[393] Ibid., pp. 63-65.
[394] Ibid., p. 65

development in the field of silk industry, metallurgy, jewellery, tanning, cottage industry and others.[395] The pursuit of industrial swadeshi and development of indigenous industry extended beyond the limits of Bengal and touched various parts of the country. In May 1906, a Bengali, Rajnarain Bose, of the rural town of Halishahr of 24-Pergunnas district, went to Madras and established a small button factory, and within a few months he also established a comb factory on a similar scale. The combined factories came to be known as the Button and Comb Factory of Messrs. Bose & Sons based in Madras. By 1910, sixty hands were engaged in the factory manufacturing buttons, combs, etc. from hones and horns, both through mechanised and manual processes. The enterprise and manufacturing ability of Messrs. Bose is further revealed by the fact that the machines used for cutting the teeth of combs were their own invention and manufactured in their own factory.[396] Another swadeshi enterprise in Madras was the Ripon pharmacy, situated at Sydenham's Road, Periamet, Madras, opened in 1913 by Dr N. Venkataswami Chetty of the University of Madras. The pharmacy was stocked with fresh drugs and chemicals and carefully selected patent medicines for patients. For more specialised work, Dr Chetty collaborated with Dr S.R. Rao and Dr B. Rajagopal in the department of bacteriology.[397]

An indigenous medical practitioner, A.S. Hakim Mohamed Shamsodien Sahib, born in 1874 in the village Govindagudi of Kumbakonam in Tanjore district, received customary primary secular and religious instruction in his native place. In 1889 he came to Madras and studied medicine for a period of eleven years under the capable tuition of his uncle, Hakim Mohamed Nizam-ud-din Sahib, who was one of the leading physicians of the city. The hardworking scholar developed into a skilled practitioner, and, acting on the advice of his uncle and other friends, he established himself by opening the Unani Medical Hall—a large establishment, consisting of three departments, namely manufacturing, packing and labeling, and correspondence. Each of these was under the supervision of a separate head. His brother, Hakim Shaik Dawood Sahib, a great Tamil scholar, was the supervisor of the packing and labelling-room. His Tamil works included *Vaidhya-amirtha Bhodini* (a book of medicine); *Navanitha Niyanan Nayana Sundari* or *Nobulnanak Nanaksunder Charitaram; Amir Hawza* (five volumes) and *Mahijabin Charitaram*. Another brother, A. Zyualabdin Sahib, was in

[395] K.V. Ganapathy Iyer, *Indian Industrialism*, Madras: Tagore, 1921.
[396] *The Dawn and Dawn Society's Magazine*, vol. XIII, no. 4 (Old Series), vol. VI, no. 4 (New Series), Apr. 1910.
[397] Somerset Playne, *Southern India: Its History, People, Commerce, and Industrial Resources,* London: The Foreign and Colonial Compiling and Publishing Co., 1914-15, p. 696.

charge of the manufacturing department. All the brothers had extensive and varied knowledge of wild herbs, drug recipes, and their efficacious manufacturing and production, and this was one of the characteristics of their ancestors, who were physicians of the Tanjore Royal Family, which, in return for their services, conferred upon them large jaghirs and valuable gifts. Many of their patients bore testimony to the fact that a simple touch of one of these skilled practitioners gave relief from many troublesome ailments. Several gold and silver medals, in addition to certificates of merit, were awarded to their medicinal productions at various exhibitions.[398]

The development of local swadeshi industries can be seen from various advertisements in journals and periodicals of the early twentieth century. The centenary volume published in memory of Dr Nil Ratan Sircar carried an advertisement about the establishment of the National Tannery Company (by Nil Ratan Sircar in 1906) and the Jaykay portable typewriting machine manufactured by Blakwoods India Limited, Calcutta. It also had a detailed advertisement of Sarabhai Chemicals, Baroda that was regarded as the hub of reliable products.[399] The manager of the Hindi Sahitya Press at Allahabad requested talukdars, landlords, and other needy people to use their press for any typing requirements. It asked for preferential treatment to native enterprises against foreign firms.[400] Dr S.K Barman propagated native medicines, cola tonic, *pudin hara*, *lall sharbat* and other medicines for better health.[401] An advertisement about the large stock of homeopathic and bio-chemic drugs received from Germany and America was advertised by Roy and Company, Princess Street, Bombay.[402] The National Watch Company in Calcutta, put up a 'Grand Clearance Sale' of 701 valuable items at Rs.2-8-0 which included toy wrist watchs, fountain pens, earrings, money bags, shoe laces, balloons, razor blades, hair pins and many others.[403]

An advertisement of *Kesraj Tail* claimed that the President of Indian National Congress Pt. Motilal Nehru, Mrs Sarojini Naidu and others had praised its oil quality.[404] The swadeshi firm Dutt and Company based at Calcutta, advertised the Charkha with the message '[F]ollow strictly the message of Mahatma Gandhi, the greatest man of the world that Charkha is the only means for the country's freedom. It will provide for half the necessaries

[398] Somerset Playne, *Southern India: Its History, People, Commerce, and Industrial Resources*, pp. 699-701.
[399] See 'advertisement', in *Nil Ratan Sircar: Centenary Celebrations*, Calcutta, 1961.
[400] Nihalkaran Sethi, *Prarambhik Bhotiki*, Banaras City: Chaukhamba Sanskrit Series, 1948, p. 81.
[401] Ibid., p. 82-85.
[402] See 'Advertisement', in *The Hindustan Review*, vol. L, no. 291, Jan. 1927.
[403] Nihalkaran Sethi, *Prarambhik Bhotiki*, p. 86.
[404] Ibid., p. 82.

of your life. Have faith in the Mahatma at least. In this Charkha, the yarns can be spun like the big charkhas…even a child can work it.' [405] In its advertisement, K.C. Vidyarthi, the manager of the Bharat Insurance Company, Lahore, claimed to be the oldest Indian Life Office Company (1896) 'purely under Indian management' and that 'every patriotic Indian must make it a point to patronize 'Bharat'.[406] These advertisements reveal how the new swadeshi industries related themselves to the growing nationalism and, by 1930s, a Swadeshi Directory was also published.

The All India Swadeshi Directory of 1933 was published by Jiwan Krishan Sharma on behalf of the Swadeshi League, Allahabad whose members included Munshi Iswar Saran, Krishna Mohan, Mohanlal Nehru, Moolchand Malviya, T.N. Sapru, Vijaya Lakshmi Pandit among others. The Allahabad Swadeshi League was an organisation that took upon itself the task of compiling a usable, informative and reliable directory to promote swadeshi goods, firms and industries. The League made sincere and meticulous efforts in this direction as they believed that 'the true spirit of swadeshi has come to stay' elaborating upon the somewhat narrow interpretation of the swadeshi spirit, the League further clarified that 'in its somewhat narrow and restricted sense it leads to the production and consumption of swadeshi commodities'[407] and appealed to Indians to understand the swadeshi spirit in a deeper sense as part of one's moral consciousness and material existence. Iswar Saran, president of the Allahabad Swadeshi League explained, 'As time goes on the feeling will grow in strength that it is the duty of a true Indian to use and encourage home made articles. India's honour demands, India's interest dictates it.'[408] Saran complemented the compilers of this directory for their service to the cause of swadeshi and conveyed his appreciation by stating that, 'the joy of simulating this spirit by spreading correct information about swadeshi goods and firms in some slight measure belongs to the compilers of this directory and there is no joy greater than the joy of service.'[409]

The various editions of the Swadeshi Directory were meant to encourage interaction between the manufacturer and consumer and advertisements served the purpose of attracting consumers. They were compendiums that comprehensively catalogued and canvassed for standing besides Indian capital, labour, manufacturing, and exhorted for the creation of

[405] Ibid., p. 82.
[406] See 'Advertisement', in *The Hindustan Review*, vol. L, no. 291, January 1927.
[407] 'Foreword' by Iswar Saran, *All India Swadeshi Directory*, Allahabad: Allahabad Law Press Journal, 1933.
[408] Ibid.
[409] Ibid.

swadeshi demand. They desired to create a national demand, an Indian demand for Indian goods on Indian terms. The Directory also mirrored the huge pool of Indian workers who had inherited traditional skills that could be easily oriented and deployed for the manufacture of everyday items of modernity. The bulk of the Directory constituted an alphabetically arranged and product-wise list of swadeshi manufacturers that had sprung up in every corner of the country interspersed with advertisements of swadeshi goods.[410] Having wholly adapted business maxims like 'Advertisement is the secret of prosperity in business' and 'A right advertisement at the right place and at the right time is sure to catch customers', the Allahabad Swadeshi League encouraged swadeshi firms to also advertise in its Hindi edition under compilation.[411]

The science-based skill primers, documented in the initial part of the chapter, were intended both to realise the goal of orienting Indian artisans and skilled workers as well as create an Indian skilled artisanal class possessing rudiments of literacy and who could read and write to the extent of utilising those primers and manuals which presented skilled and science based manufacturing of such everyday commodities premised on skilled everyday technology. Moreover, the consumer was not a mere citizen but was expected to become an active participant and a national citizen through the practice of swadeshi. He was to be a bearer and carrier of the swadeshi spirit not in hollow terms but in the true sense as a user and upholder of the cause. The Directory itself was an all India one and was directed at creating a national market. Swadeshi thus encompassed within itself a vast array of attributes like patriotism, entrepreneurship, inheritance of traditional Indian artisanal skill and its preservation and proliferation, market and consumption and competition with imported commodities.

The Swadeshi Directory of 1933 provided details and addresses of swadeshi manufacturers across India related to various activities of life and commodities produced through craft combined with everyday technologies. It carried brief descriptions of an astounding range of commodities from bangles, boots, carpets, chalks, cigarettes, kitchen cutlery, electrical goods, school uniform, soaps and cosmetics, mirrors and glasswork, shoes and chappals, inks, nibs, stamp, lac and other stationary products, embroidery to smaller agricultural implements, printing works, scientific apparatus and textiles.[412] In the case of

[410] *All India Swadeshi Directory*, pp. 1-130.
[411] Ibid., p. 54.
[412] The list of swadeshi textiles was not given as, according to the Directory,

mills, the 1933 Directory recorded its regret for not bringing out a list of 'genuine Swadeshi Mills' as it was still in the process of investigating such mills. It observed that 'The list published in our last edition can not be reproduced as most of the mills certified have broken their pledges.'[413] Thus, the compilers of the Directory evolved and followed a strict criterion for identifying and classifying products as swadeshi including only those goods that could genuinely sustain the swadeshi pledge.

As an inventory of swadeshi goods, the Swadeshi Directory also carried several advertisements of the products it described. For instance, it carried advertisements of swadeshi products like foot-ware, knives and furniture. Advertisements of the Allahabad Shoe Stores, dealers and sellers of boots, shoes and chappals, K.C. Goswami and Company which sold swadeshi knives with the punch line 'Beautiful, strong, sharp and durable yet very cheap', [414] and Godrej which claimed its furniture to be 'superior to wooden cupboards yet no higher in price' were a few of the swadeshi industries that advertised their products in the Directory. As part of its larger endeavour, the Allahabad Swadeshi League also requested swadeshi manufactures to send their goods for display at the Swadeshi Industrial and Commercial Museum, Allahabad.[415]

An interesting feature of the All India Swadeshi Directory of 1933 was the printing of swadeshi slogans at the bottom of almost every page. Each page of the Directory had an appeal in the form of a slogan or a statement of purpose; an exhortation to buy swadeshi goods. The common consumer citizen of the country could partake in and utilise those commodities, which would empower him/her to negotiate the demands and necessities of everyday modernity. An appeal to the patriotic consciousness of the consumer and the viability and sustainability of Swadeshi industries and production were the main themes resonating in the slogans through the Directory.

Through these slogans, the Allahabad Swadeshi League attempted to imbue both manufacturers and consumers with the message of patriotism, productivity and economic self sufficiency: 'Swadeshi blesses both purchaser and manufacturer' and 'The noblest motive is the doing of public good by practising Swadeshi.'[416] For instance, slogans such as 'One who uses Swadeshi serves his country faithfully', 'Love of country demands you to practise

[413] *All India Swadeshi Directory*, p. 76.
[414] Ibid.
[415] Ibid.
[416] Ibid., pp. 54, 4.

Swadeshi', 'These days the highest patriotism is to preach for Swadeshi goods and Buy Swadeshi' and 'Mother country calls out to you to practise Swadeshi and do her your duty' directly invoked the patriotic zeal of Indian citizens to sell and buy swadeshi.[417] For the League, 'Of all the duties, the love of Swadeshi, with faith and constancy in it, rank[ed] first and highest' and that every citizen should 'Search for Swadeshi, seek for Swadeshi, buy Swadeshi and be Swadeshi.'[418]

The economic aspect of swadeshi as an aid to industry, for employment generation and to alleviate poverty were also brought out through these slogans: 'Industry must be thatched with Swadeshi, else it may not become stationary', 'Every body should insist on Swadeshi when buying, because in doing so he will be cutting short the great unemployment in the country', 'Take care of the starving millions of your country by practising Swadeshi', 'You can cure the country's ills and also relieve the poor by buying Swadeshi'.[419]

In presenting commodities as national goods, the Swadeshi Directories also stressed the idea of the consumer as an active agent in shaping the destiny of his/her country's well being and future: 'It is the customer who can make the Swadeshi Industry prosperous and not the seller' and 'By buying Swadeshi you [the customer] will do your duty to the poor, and feed needy and starving millions lest they die.'[420] A practitioner of swadeshi was also described as a 'national worker', one who would contribute to the material progress of the country through industrialism. Industrialism as a prime component of swadeshi was particularly spelled out through the emphasis on entrepreneurial engagement. The focus on small skill based industries and promoting entrepreneurship through everyday technologies blended with the thrust on promoting science writing in the vernacular, discussed in the earlier section of this chapter, and contributed to making swadeshi an effective weapon of science in the Indian context. This dimension found constant reflection and reiteration in the efforts of both local university teachers and practitioners of high science like P.C. Ray.

Nonetheless, the organisation of Big Science and the emphasis on import substitution within a compressed period of time compelled the nation-state to drift away from that 'wax and sealing' science which had the potential to align with craft to create diversified everyday

[417] Ibid., pp. 12, 17, 43, 49.
[418] Ibid., pp. 63, 20.
[419] Ibid., pp. 90, 23, 50, 21.
[420] Ibid., pp. 34, 99.

technologies as a basis for welfarism and employment. The advocacy of wage goods model of manufacturing advocated by a group of economists and planners chief among them being C.N. Vakil and Brahmanand was also never given a chance. The small was beautiful but the Big was a spectacle and in their partnership was the future of India. That future is yet to be realised in India.

Table 3.3: LIST OF SWADESHI PRODUCTS FROM THE SWADESHI DIRECTORY OF 1933

Absorbent cotton	Cookers	Lace	Sealing wax and shellac
Acids	Crochet needle	Letter files	Seeds and plants
Agricultural instruments	Crockery cement	Leather and leather goods	Self inking stamp pad
Aluminium wares	Cutlery	Locks	Silk
Antiseptics	Duplicators	Lockets and badges	Slate
Art work	Drawing instruments	Machinery	Snuff
Arrowroot	Educational	Manures	Soaps
Ayurvedic medicines	Electrical goods	Mantle	Sports goods
Balance and weighing machine	Embroidery	Maps	Steamship companies
Banks	Engine cleaning waste	Matches	Steel trunks and safes
Bangles	Envelope makers	Medicines	Stone ware pottery
Battery	Enamelled goods	Metal polish	Stroppers for razors
Belting	Fertilisers	Metal goods	Spirit stoves
Biscuits and barley	Filter	Mills*	Surgical dressing
Blanco	Fire works	Miscellaneous	Sugar
Blankets	Fountain pens	Mosquito curtains	Tea and coffee
Block makers	Food for infants	Musical instruments	Tanneries
Boot lace	Furniture	Mica	Taxidermists
Boot polish	Galvanized iron works	Nibs	Thread
Boots and shoes	Glass works	Newar	Tin
Brushes	Gold and silver thread	Oils	Tin printers
Buckets	Gramophone	Oil cloth	Tin boxes and cans
Buttons	Greenroom requisites	Oil crushers	Ties
Cameras	Gums and pastes	Paints, polishes and varnishes	Tiles and building material
Canvas	Gut manufacturers	Paper mills	Tooth powder
Canvas polish	Hair oils	Pens, pencils and holders	Toys
Canning condiments and confectionary	Hair pins	Perfumeries and toilets	Typewriter ribbons
Card board boxes	Hats and caps	Photographic materials	Trusses
Carpets and rugs	Hardwares	Pipes	Tricycles and perambulators
Calico printers and dyers	Hosiery and knitted goods	Playing cards	Type foundries
Calendar printers	Insecticide	Pins and clips	Tooth paste
Candles	Inks	Potteries	Tobacco
Cane works	Ink, fountain pen	Presentation articles	Turpentine
Cement and lime	Inks, printing	Printing works	Umbrella cloth
Chalk and crayons	Inks, cloth marking	Pumps and pulleys	Vaccines and Serums
Chemicals	Inks, rubber stamp	Quinine	Vinegar
Cigarettes and cigars	Indigo	Razor	Water filter
Clay models		Razor blades	Water proof
Clocks		Razor pastes	Wire netting and wire cage
		Recipes	
		Rivets and nuts	
		Ropes, coirs and munj	

Coir matting and rope Cotton yarn and weaving accessories Combs Corks Cotton piece goods	Insurance Iron Ivory works Jewellers Khadi Lamps and lanterns	mattings Sago Salts Sand paper Sandalwood oil Scientific apparatus	Woollen goods Writing pads, Zarda (for chewing bettles)

'We regret we are not able to publish the list of genuine Swadeshi Mills as the matter is under investigation. The list published in our last edition cannot be reproduced as most of the mills certified have broken their pledges. As soon as a fresh list is compiled the League would publish the same at the end of this directory as a supplement. [p.76]

Celebrating the Spirit of Science and Swadeshi

The spirit of science and swadeshi was also reflected and celebrated in the literature and poetry of the times. The available literature in Hindi bears the stamp of the swadeshi spirit. Litterateurs, poets and bards of national, regional and local fame often radiated the spirit of swadeshi by invoking and welcoming science and blending science-based industrialism with Indian craft tradition and artisanal labour through their rendered poems and songs. The beauty and creativity of Indian craft tradition, diligence and dignity of Indian artisan's labour, the fostering of science based skills to enhance the potential of the artisans of India, claim to parity by Indian scientists in the domain of knowledge, the orientation of scientists towards fostering industrialism – all converged and permeated to create the imaginings of India.

Sridhar Pathak, the noted Hindi romantic poet who pioneered poetry in *Khadi Boli* also served as editor of the *Vijnana* in the 1920s. The *Vijnana* provides ample evidence of poets often invoking science as if they were invoking a deity. Science was personified as a goddess who had to be propitiated and obeisance was paid to this new knowledge in the same way one invoked gods and goddesses for one's wellbeing and prosperity. By invoking and welcoming the goddess of science they sought the country's prosperity and progress. It is in this sense that blessings from the goddess of science were sought to strengthen the spirit of swadeshi. It is through the worship of the goddess of science that the swadeshi spirit too strengthened the mother goddess or *Bharat Mata*. Poets and poems of swadeshi also paid tributes to famous Indian scientists like P.C Ray and Jagdish Chandra Basu.

The local contexts and celebration of the spirit of swadeshi industrialism can also be seen in local poems and songs. *Abhyuday*, Malaviya's weekly reported and welcomed various

swadeshi enterprises that were being founded and nurtured.[421] A poem by Vishnu Dutt Sharma in *Abhyuday* invoked people to rise from their slumber to welcome the dawn of swadeshi:

Utho ab nind ko tyago,
Hua bilkul savera hain.
Hawa chalti swadeshi ki,
Tumhe alas ne ghera hai…[422]

(Wake up and abandon your sleep, laziness and inertia
and see the dawn of swadeshi)

Invoking the swadeshi spirit, the Kanpur Woolen Mills requested Indians to use their swadeshi wool product *Lal Imli*. It insisted that each patriot should support the native industry to make the country prosperous and should not buy foreign woollen goods.[423] Murlidhar Gupta, a local publisher from the Aligarh region, edited and compiled poems, ghazals, bhajans and songs by local poets of the region on swadeshi titled *Sawdeshanuraag-Gitavali athwa Bhartodya Bhajnawal*. The *Sawdeshanuraag Gitavali* stands out as a rare source displaying the local enthusiasm and celebration of the spirit of swadeshi. One of the poems in this collection, '*Sone ki Chidia*' highlighted the impact of swadeshi upon weavers:

yeh layega jad khichkar dekh lena,
Swadeshi ka yaron asar dekh lena…
Yeh khte hain Hindustan ke julahein,
Hamara bhi sahib hunar dekh lena,
Kaha kab ki Dasan ke jute ne pahino,
Magar sahibo apna sar dekh lena.[424]

(Swadeshi will bring impact in every field
and the art of weavers would be on display.
I am not asking you to not wear the shoe of Dassain
but see your head).

Other poems emphasised on Hindu-Muslim unity, importance of charkha and its glory. One of the poems titled *'Charkha-mahima'* by Gajadhar Singh, Rangoon wrote that:

Yeh charkha nai hai bhaiyon,
yeh chakra hai bhagwaan ka,

[421] *Abhyuday*, 3 January 1908.
[422] *Abhyuday*, 14 February 1908.
[423] *Abhyuday*, 8 February 1912.
[424] Murlidhar Gupta, *Sawdeshanuraag-Gitavali athwa Bhartodya Bhajnawali,* Aligarh: Arya Pustakalaya, 1921, p. 19.

Shubh sarvatha sadha yehi hai desh ke uthan ka,
Charkha bina yeh desh charkha ho rha sarvatha,
Dekhi nai jati yahan ab desh ki duster vyvastha,

Chickan malmal bhi rhi prasiddh dhake ki sada,
Bhagalpuri bhi dhotian prakhyaat thi yha pr tada…[425]

(This is not a spinning wheel
but the wheel of lord [sic Krishna]
and the way of progress of country.
Without spinning wheel the country has lost its importance
we should remember that
once upon a time the chickankadi and malmal
of Dhaka and dhoti of Bhagalpur was quite famous)

Some of the poems talked about adopting swadeshi in mind and soul. Swadeshi should pervade the temple, mosque, trade, governance, honesty, and among every Indian.[426] These poems and bhajans were a reflection of the swadeshi spirit and growing nationalism in India.

Conclusion

This chapter has made use of a wide array of sources ranging from everyday manufacturing to educational textbooks as evidences of the coming together of the spirit of swadeshi, science and industrialism. The establishment of indigenous educational institutions complemented these efforts. These evidences from various realms give us an inkling of how the nation was nurtured by its local roots of entrepreneurship, educational initiatives, linguistic innovation, and the moral responsibility that the educated felt for the dissemination of these skills and knowledge. For instance, Gandhi's Khadi initiative and village industries, experiments with *Nai Talim*, and establishment of native vidyapiths were all similar initiatives reflecting the spirit of swadeshi. As far as the nation in the making or the society being reshaped was concerned, these efforts, high and low, local or pan-Indian, did converge and reinforce the spirit of science, industry and industrialism.

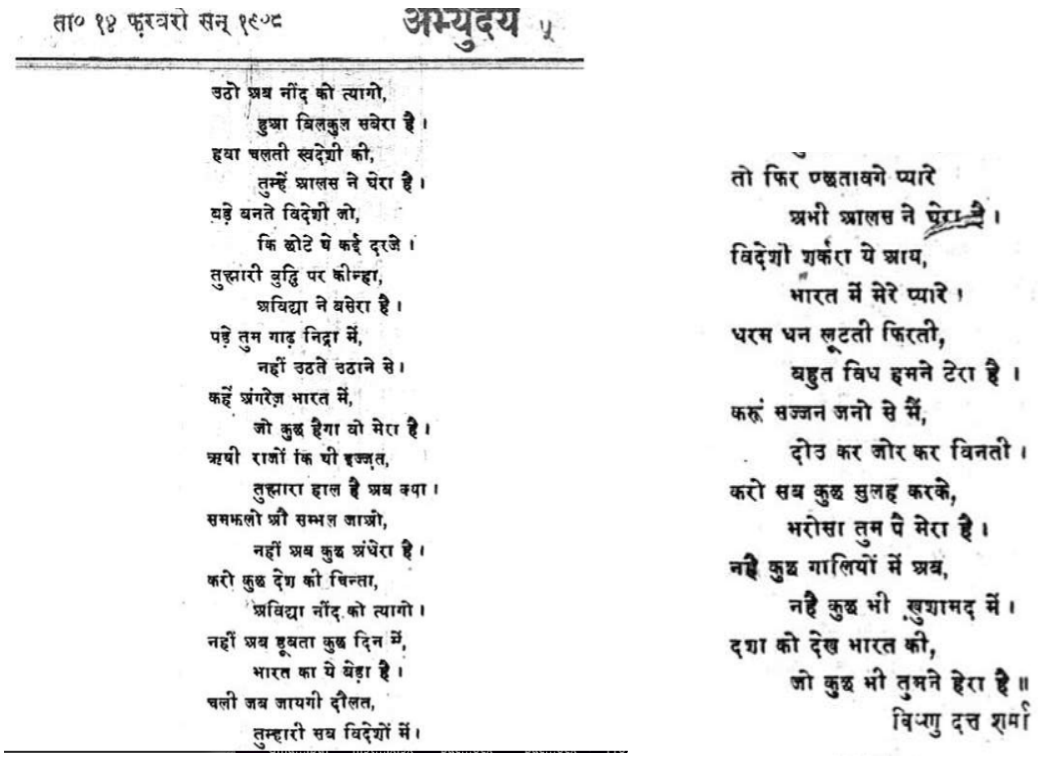
The political context of the Swadeshi Movement in Bengal provided deep cultural contexts to the proliferation of science publications and institutions in the Hindi public sphere. The emphasis on rendering science textbooks and popular tracts during the subsequent decades of the swadeshi movement presented an alternative to expand the realm

[425] Ibid., p. 21.
[426] Ibid., pp. 23-24.

and reach of the process of science education. It helped to go beyond the limits of the colonial system of knowledge. Hindi science writing in general witnessed considerable growth. Many institutes were set up which published scientific magazines, journals, articles and literature in local languages. Subsequently, the historical experience and skill of Indian artisanal class was to be welded to the knowledge acquired by the university science graduates and postgraduates. This inclusive and accommodative reconciliation of western science and Indian society was to provide new impetus to Indian nationalism. The evidences from various realms give us an inkling of how the nation was nurtured by its local roots of entrepreneurship, educational initiatives, linguistic innovation, and the moral responsibility that the educated felt for the dissemination of these skills and knowledge. As far as the nation in the making or the society being reshaped was concerned, these efforts, high and low, local or pan-Indian, did converge and reinforce the spirit of science, industry and industrialism. As David Arnold also pointed out, 'The *swadeshi* cause fostered a new technological awareness in which machines and the commodities they produced became a major site of contention for the Indian nationalist struggle'.[427]

This chapter has also tried to contextualise the debates regarding the ways of the assimilation, naturalisation and domestication of science, technology and medicine within the ambit of science and swadeshi. The idea of National Education and the urge to reform colonial universities and establish new national universities and similar centres of learning have been documented in this context. How the deployment of debates regarding science and technology infused the discussion on indigenous industrialism and informed the larger debates on national science have also merited attention and analysis throughout the narrative.

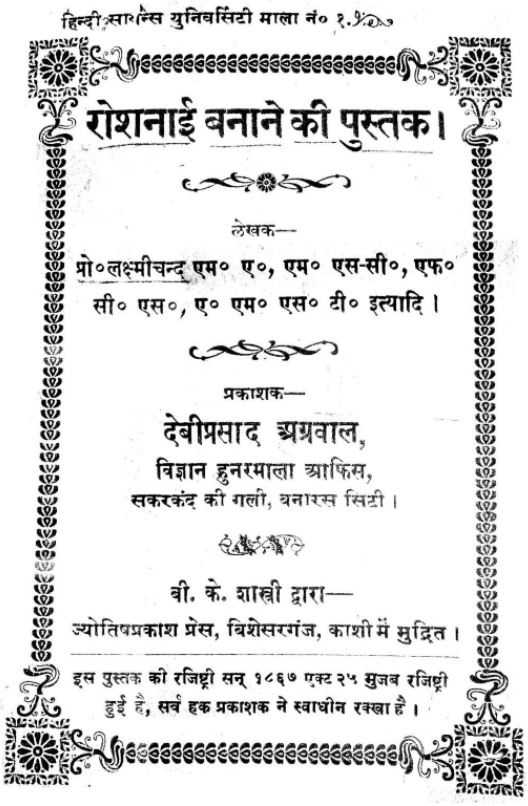
[427] David Arnold, *Everyday Technology: Machines and the Making of India's Modernity*, Chicago: The Chicago University Press, 2013, p. 20.



ता० १४ फ़रवरी सन् १९०८ अभ्युदय ५

उठो अब नींद को त्यागो,
हुआ बिलकुल सवेरा है।
हवा चलती स्वदेशी की,
तुम्हें आलस ने घेरा है।
बड़े बनते विदेशी जो,
कि छोटे थे कई दरजे।
तुम्हारी बुद्धि पर कीन्हा,
अविद्या ने बसेरा है।
पड़े तुम गाढ़ निद्रा में,
नहीं उठते उठाने से।
कहें अंगरेज़ भारत में,
जो कुछ हैगा वो मेरा है।
अरी राजों कि थी इज्ज़त,
तुम्हारा हाल है अब क्या।
समझलो औ सम्भल जाओ,
नहीं अब कुछ अंधेरा है।
करो कुछ देश की चिन्ता,
अविद्या नींद को त्यागो।
नहीं अब डूबता कुछ दिन में,
भारत का ये बेड़ा है।
चली जब जायगी दौलत,
तुम्हारी सब विदेशों में।
तो फिर पछतावगे प्यारे
अभी आलस ने घेरा है।
विदेशी शर्करा ये आय,
भारत में मेरे प्यारे।
धरम धन लूटती फिरती,
बहुत विध हमने टेरा है।
करूं सज्जन जनो से मैं,
दोउ कर जोर कर विनती।
करो सब कुछ सुलह करके,
भरोसा तुम पै मेरा है।
नहीं कुछ गालियों में अब,
नहीं कुछ भी खुशामद में।
दशा को देख भारत की,
जो कुछ भी तुमने हेरा है॥
विष्णु दत्त शर्मा

Figure 3.6: Vishnu Dutt Sharma's poem in *Abhyuday*, 14 Feb 1908.



हिन्दी साइन्स युनिवर्सिटी माला नं० १.

रोशनाई बनाने की पुस्तक।

लेखक—

प्रो० लक्ष्मीचन्द एम० ए०, एम० एस-सी०, एफ० सी० एस०, ए० एम० एस० टी० इत्यादि।

प्रकाशक—

देवीप्रसाद अग्रवाल,

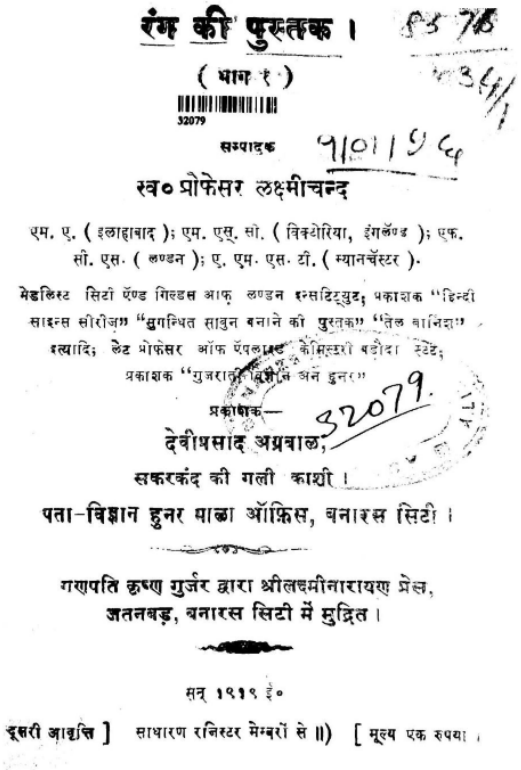
विज्ञान हुनरमाला आफिस,

सकरकंद की गली, बनारस सिटी।

बी. के. शास्त्री द्वारा—

ज्योतिषप्रकाश प्रेस, बिशेसरगंज, काशी में मुद्रित।

Figure 3.7: *Roshnai Bnane ki Pustak* by Lakshmi Chand (1915)



रंग की पुस्तक।

(भाग १)

सम्पादक

स्व० प्रोफेसर लक्ष्मीचन्द

एम. ए. (इलाहाबाद); एम. एस. सी. (विक्टोरिया, इंगलैण्ड); एफ. सी. एस. (लण्डन); ए. एम. एस. टी. (स्यानचैस्टर)।

मेडलिस्ट सिटी ऐण्ड गिल्डस आफ् लण्डन इन्सटिट्यूट; प्रकाशक "हिन्दी साइन्स सीरीज़" "सुगन्धित साबुन बनाने की पुस्तक" "तेल बानिश" इत्यादि; लेट प्रोफेसर ऑफ ऐप्लाइड केमिस्ट्री बड़ौदा स्टेट; प्रकाशक "गुजराती विज्ञान अने हुनर"

प्रकाशक—

देवीप्रसाद अग्रवाल,

सकरकंद की गली काशी।

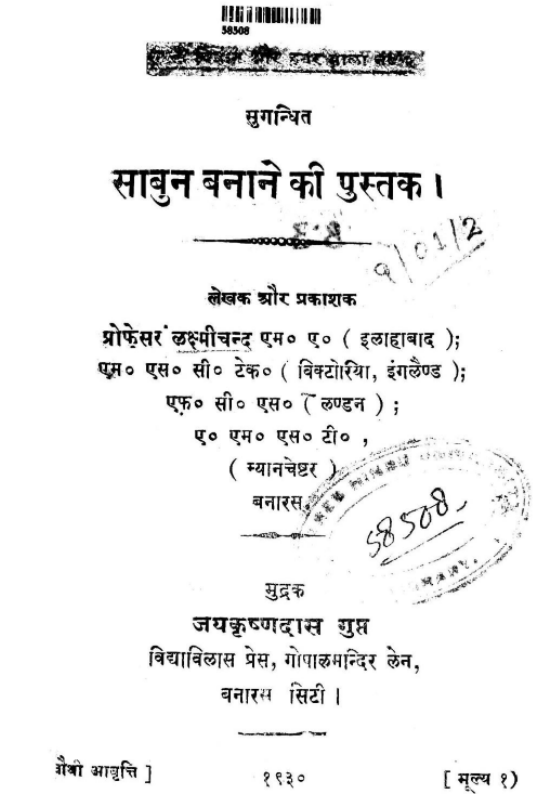
पता—विज्ञान हुनर माला ऑफ़िस, बनारस सिटी।

गणपति कृष्ण गुर्जर द्वारा श्रीलक्ष्मीनारायण प्रेस, जतनबड़, बनारस सिटी में मुद्रित।

सन् १९१९ ई०

दूसरी आवृत्ति] साधारण रनिस्टर मेम्बरों से ॥) [मूल्य एक रुपया।

Figure 3.8: *Rang ki Pustak* ed. by Lakshmi Chand (1916).



सुगन्धित

साबुन बनाने की पुस्तक।

E-8

लेखक और प्रकाशक

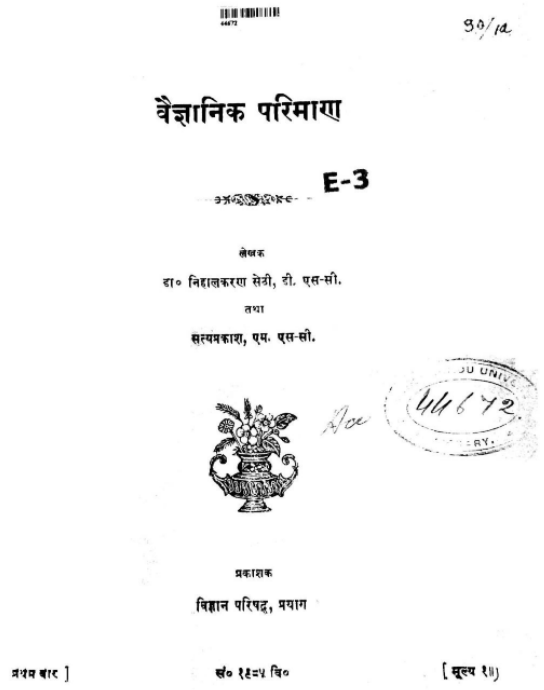
प्रोफ़ेसर लक्ष्मीचन्द एम० ए० (इलाहाबाद);
एम० एस० सी० टेक० (विक्टोरिया, इंगलैण्ड);
एफ़० सी० एस० (लण्डन) ;
ए० एम० एस० टी० ,
(म्यानचेष्टर)
बनारस।

58508

मुद्रक
जयकृष्णदास गुप्त
विद्याविलास प्रेस, गोपालमन्दिर लेन,
बनारस सिटी।

दूसरी आवृत्ति] १९३० [मूल्य १)

Figure 3.9: *Sughandit Sabun Bnane ki Pustak* by Lakshmi Chand (1930; 4th rpt.).



वैज्ञानिक परिमाण

E-3

लेखक
डा० निहालकरण सेठी, डी. एस-सी.
तथा
सत्यप्रकाश, एम. एस-सी.

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विज्ञान परिषद्, प्रयाग

प्रथम बार] सं० १९८५ वि० [मूल्य २॥)

Figure 3.10: *Vaigyanik Pariman* by Nihalkaran Sethi and Satyaprakash (1928).

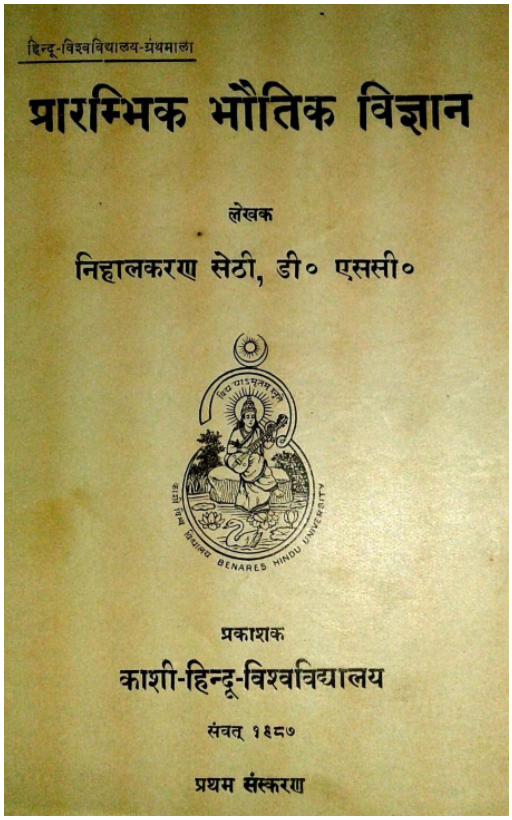

Figure 3.11: *Prarambhik Bhotik Vigyan* by Nihalkaran Sethi (1928).

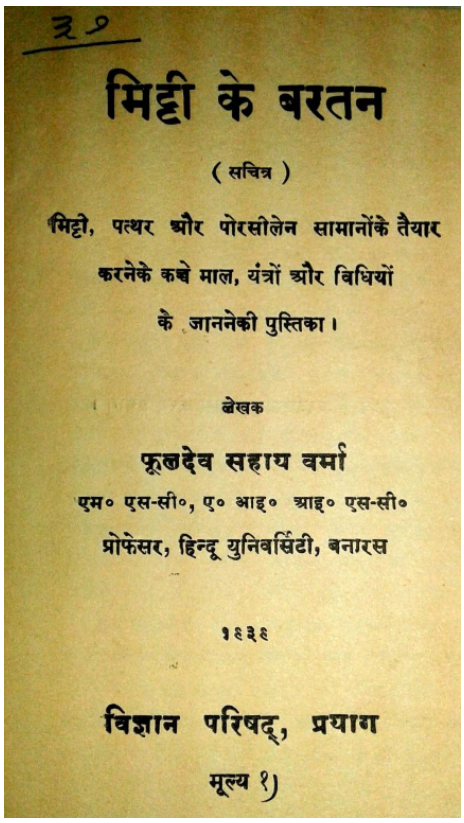

Figure 3.12: *Mitti ke Bartan* by Phuldeo Sahay Varma (1939).

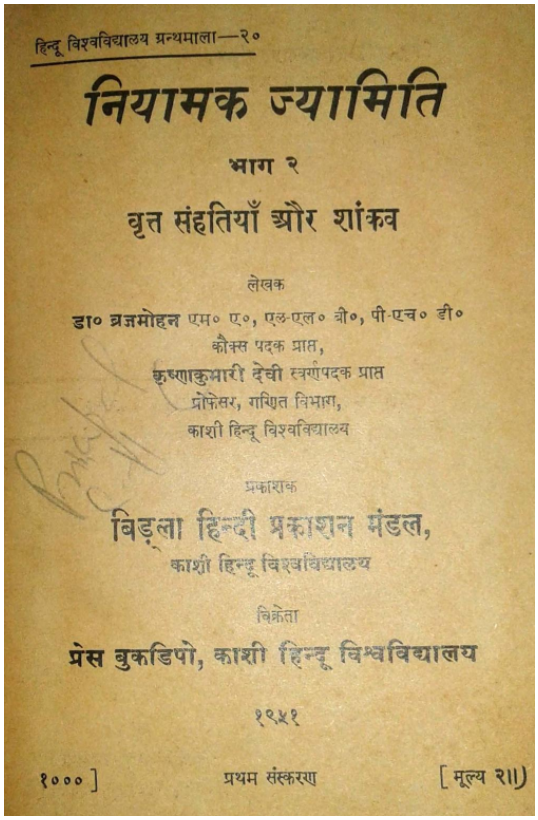

Figure 3.13: *Niyamak Jyamiti: Vritt Samhita aur Shankav*, vol. II by Braj Mohan (1951).

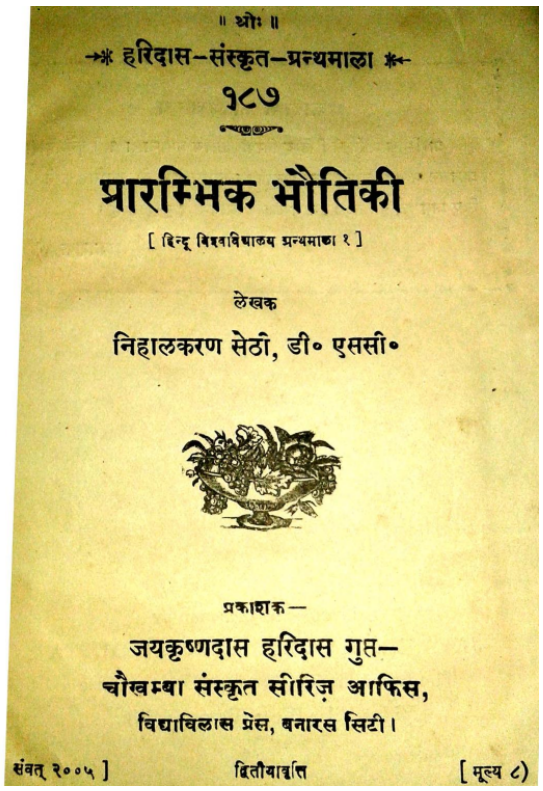

Figure 3.14: *Prarambhik Bhotiki* by Nihalkaran Sethi (1948, 2nd rpt.).

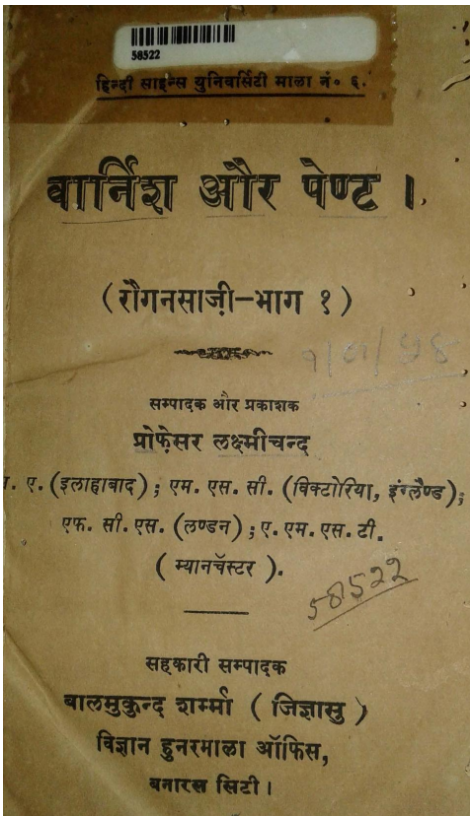

Figure 3.15: *Warnish aur Paint* (*Raughan Sazshi*) ed. by Lakshmi Chand (1917).

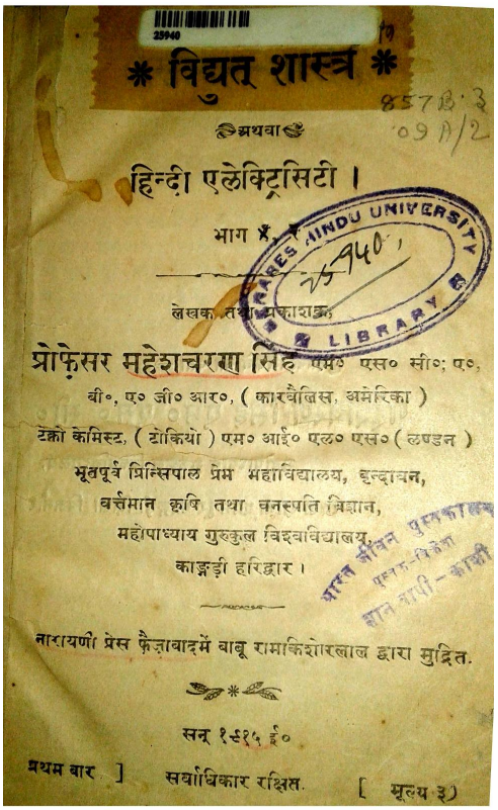

Figure 3.16: *Vidhyut-shastra athwa Hindi Electricity* by Mahesh Charan Sinha (1915).

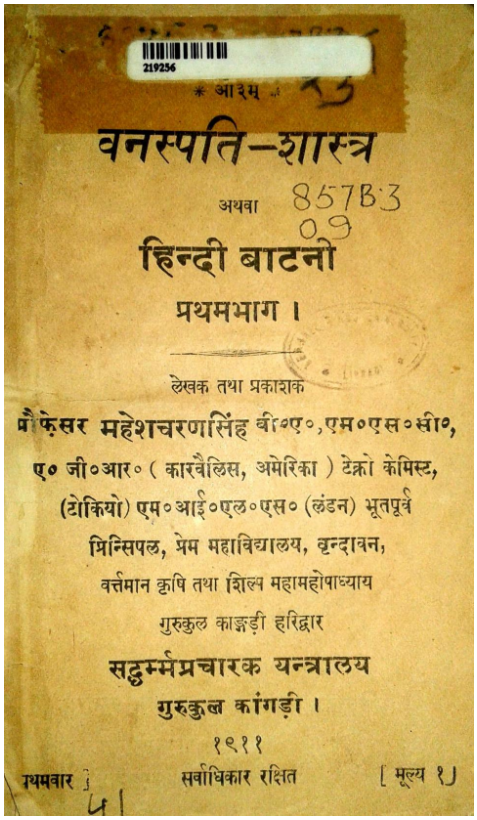

Figure 3.17: *Vanaspati-shastra athwa Hindi Botany* by Mahesh Charan Sinha (1911).

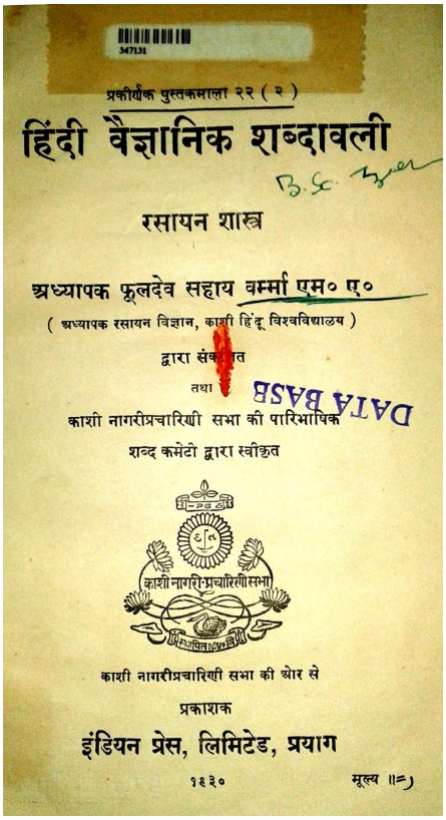

Figure 3.18: *Hindi Vagyanik Shabdawali: Rasayan Shastra* compiled by Phuldeo Sahay Varma (1930).

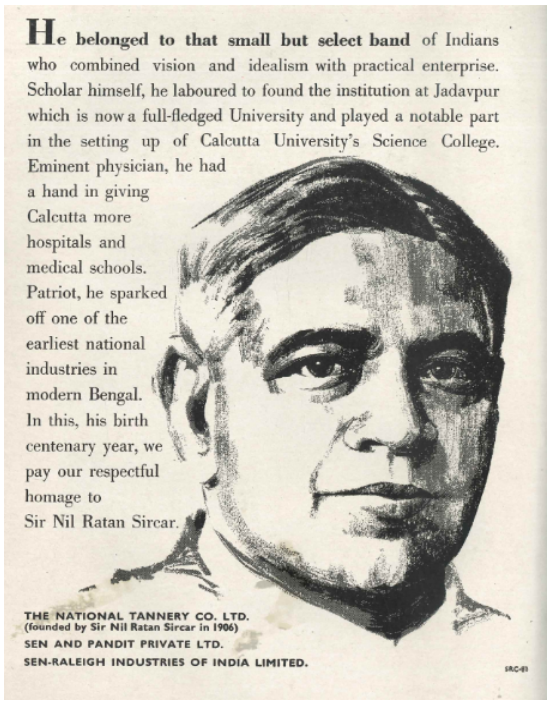

Figure 3.19: Dr Nil Ratan Sarkar


ALL INDIA
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1933

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Figure 3.20: *All India Swadeshi Directory* 1933.

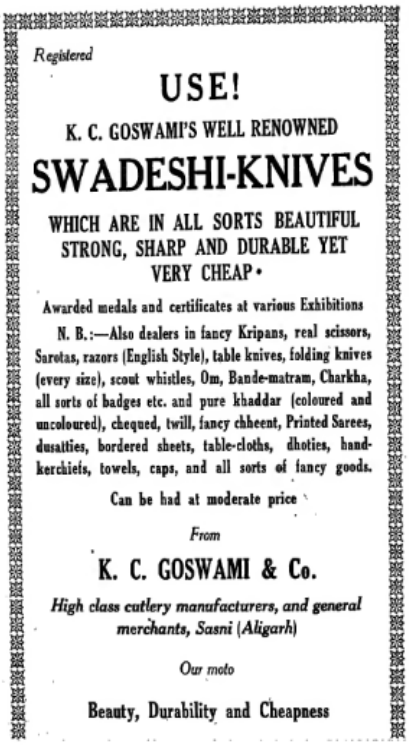
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Figure 3.21: Advertisement of swadeshi knives in *All India Swadeshi Directory* 1933.

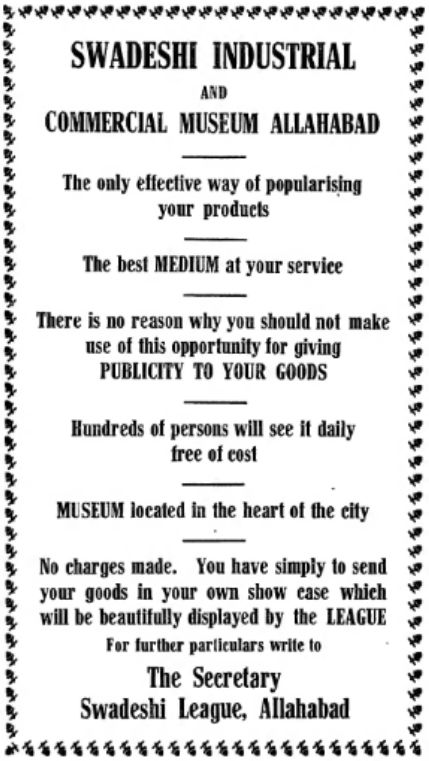

Figure 3.22: Advertisement of Swadeshi Industrial and Commercial Museum Allahabad in *All India Swadeshi Directory* 1933.

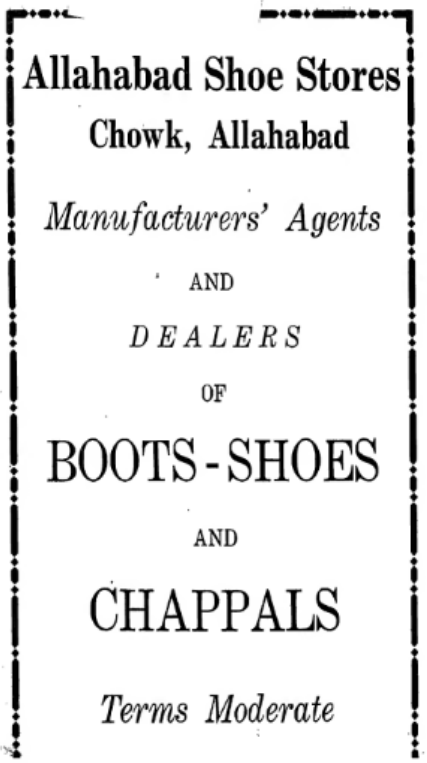

Figure 3.23: Advertisement of Allahabad Shoe Stores in *All India Swadeshi Directory* 1933.

Figure 3.24: Advertisement of Bharat Swadehi Mirrors in *All India Swadeshi Directory* 1933.

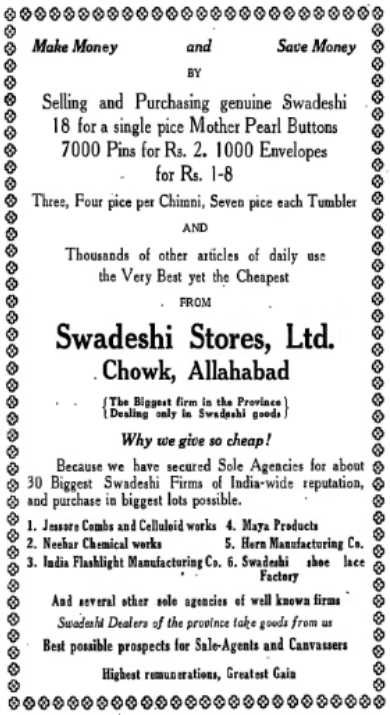

Figure 3.25: Advertisement of Swadeshi Stores, Ltd. in *All India Swadeshi Directory* 1933.

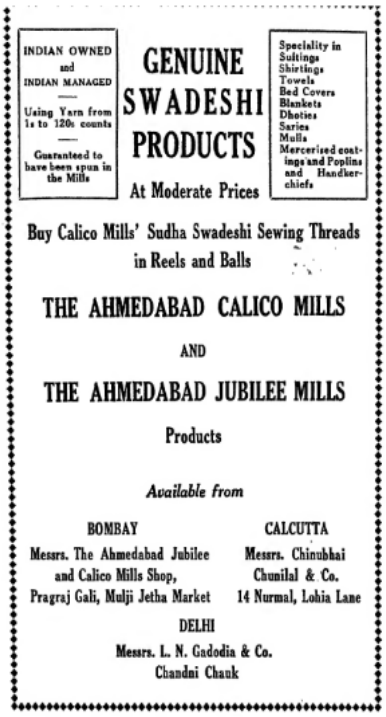

Figure 3.26: Advertisement of The Ahmedabad Calico Mills in *All India Swadeshi Directory* 1933.

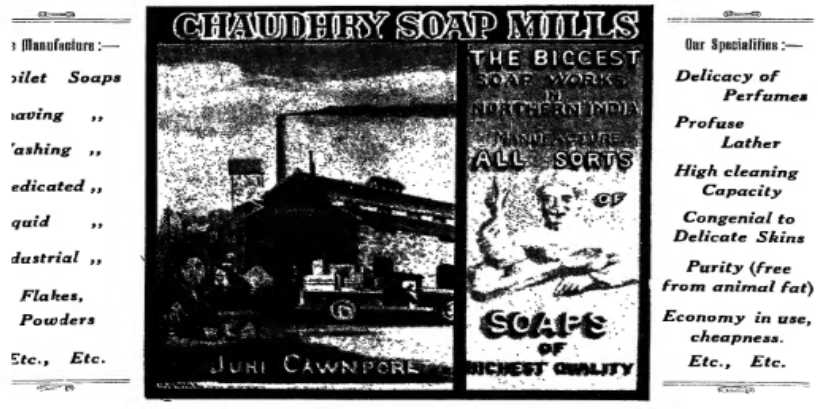

Figure 3.27: Advertisement of Chaudhry Soap Mills in *All India Swadeshi Directory* 1933.

Figure 3.28: Advertisement of Mysore Sandal Soap in *All India Swadeshi Directory* 1933.

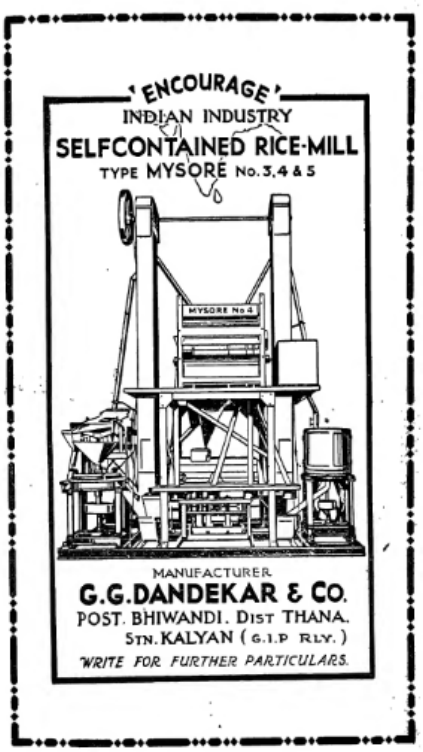

Figure 3.29: Advertisement of Self Contained Rice Mill in *All India Swadeshi Directory* 1933.

Figure 3.30: Advertisement of a Godrej Safe in *All India Swadeshi Directory* 1933.

Figure 3.31: Advertisement of a Godrej Steel Almirahs in *All India Swadeshi Directory* 1933.

Figure 3.32: Advertisement of Chitalia Bros in *All India Swadeshi Directory* 1933.