

Forgotten Propagator of Science

Kolhapur's Balaji Prabhakar Modak

Balaji Prabhakar Modak was a man who went against his times by fearlessly advocating the imperative for vernacular education and the need for scientific education, to help bring his country at par with the west. He was one of the first in western India to begin translation of important scientific works into Marathi, using words in regular usage.

Yet, Modak's contribution was equally noteworthy in history – his work on the history of Kolhapur constituting a landmark in Marathi historical writing. Sadly he left no inventions or a loyal band of followers after him, which explains his invisibility in the wider canvass of Indian scientific history.

ABHIDHA S DHUMATKAR

Balaji Prabhakar Modak (March 22, 1847 to December 2, 1906) was a great intellectual from western India in the latter half of the 19th century. He tried to create a scientific attitude in Maharashtra by spreading scientific knowledge through his science books in Marathi, public lectures-cum-demonstrations on science and annual science exhibitions in Kolhapur. He viewed science as an impetus to the regeneration not only of Indian industry and agriculture but also of the Indian nation as a whole. A short review of the movement for the spread of science in India in the 19th century would serve as background to understand Balaji Prabhakar Modak's ideas and his work.

In the 19th century, a process of modernisation began in India with the establishment of British rule. For their administrative and commercial needs, the British were compelled to introduce modern means of transport and communications like steam-engine railways, posts and telegraphs which inspired feelings of awe and adoration among average Indians towards their colonial masters and their advanced civilisation. Enlightened Indians like Raja Ram Mohan Roy and Balshashtri Jambhekar championed science education out of admiration for the scientific and material progress made by the modern western civilisation and they desired its marriage rather than conflict with Indian cultural ethos. The introduction of English education, an outcome of the triumph of the Anglicist officers of the East India Company over the Orientalists in 1835, led to an intellectual renaissance in India. However, the acceptance of the filtration theory by the British government,

coupled with the predominance of the English language in education arrested the percolation of education at grass root level. The diffusion of western knowledge, including modern science, being the main purpose of English education, science formed a part of the curriculum and western scientific traditions on the British model were gradually transplanted and institutionalised in the early decades of the 19th century.¹

Science education was started in Hindu College at Calcutta in 1823. Science and mathematics classes were gradually introduced in Sanskrit College at Benaras and Calcutta Madarassa. Medical schools were set up at Bombay and Calcutta in 1825. Native School Book Society, Calcutta (established in 1817) published Bengali textbooks including science books.

With the inclusion of natural sciences in the school curriculum remarkable changes were witnessed in the policy and contents of education in Bombay Presidency under the governorship of Mount Stuart Elphinstone (1819-1827). Bombay Native Education Committee was set up in 1820 to write textbooks in Marathi and Gujarathi in 1820. Engineering Institute established by George Resto Jervis in Bombay in 1823 was the first institution all over India, imparting engineering education through Indian languages. The Grant Medical College, founded in 1845 (developed out of the Medical School) produced ingenious scientists like Bhau Daji Lad, who invented a medicine for leprosy by synthesising allopathic and ayurvedic medical sciences.

After 1875, there was a growth of scientific and technical education all over the

country. Although the Woods Dispatch of 1854 recommended scientific instruction in the arts colleges; only in 1875, did Grey, the Director of Public Institution (DPI) of Bombay propose a chair for science in Bombay University. H Woodrow, the DPI, Bengal advocated the teaching of the physical science at school level and rewards and financial incentives to produce science teachers.² The BSc degree (first of its kind in India) was introduced in Bombay University in 1879, during the governorship of Sir Richard Temple.

Issues in Science Education

The major problems in science education were – shortage of funds, use of English as the medium of instruction and wrong government policy. Except for small annual grants for apparatus and chemicals, the government did not spend adequately on science education. Further, grants were cornered by city colleges, adversely affecting science education in mofussil areas. Science courses were handicapped by want of scholarships and laboratory facilities. Due to high fees, especially in professional courses like medicine or engineering, students preferred to join only those courses having scholarships and guaranteed employment.

The use of English as the medium of scientific instruction deprived Indian languages of science literature and terminology and encouraged rote learning in science education among Indian students. In order to avoid this, Indians advocated the use of Indian terminology in science for wider diffusion of science education.

In 1867, the British Indian Association of Science of the North Western province submitted a memorandum pleading for the introduction of science education through Indian languages using terminology coined from Sanskrit, Arabic and Persian. The memorandum forwarded by Aligarh Scientific Society in 1867 and Bihar Scientific Society in 1868 for diffusion of European sciences through Indian languages was accepted by the central government in March 1870. The Aligarh Society protested against the step-motherly treatment meted out to textbooks written by Indian authors in favour of books published by the DPI. The individuals and societies who wrote and translated science books in Indian languages for primary and secondary school levels faced financial difficulties in the absence of state patronage. There was no all-India policy for science education. Besides inadequate laboratory experience did not prepare students for industrial employment.³

The growth of science education engendered a movement for the spread of scientific knowledge through the translation of scientific literature, public lectures and scientific societies. Early science writers in Indian languages were European, namely, captain George Resto Jervis and McLendon. Later on Balshashtri Jambhekar, Hari Keshavji Pathare, Bhau Mahajan and Kero Lakshman Chatre (in Marathi), Master Ramchandra and Omkar Bhat (in Hindi), Aukhoy Dutt (in Bengali) took the lead in the translation as well as in original scientific literature. Journals like *Vigyan Kaumudi* (1860), *Vigyan Rahasya* (1871), *Vigyan Vikas* (1873), *Vigyan Darpan* (1876), *Sachitra Vigyan Vikas* (1882), *Chikitsa Darshan* (1887), *Digdarshan* and *Gyan darshan* (1837), published information on science through Bengali and Marathi. Initial emphasis on mathematics and astronomy was soon diversified to agriculture, physics, chemistry, veterinary science and hygiene. The Native Education Society from Bombay awarded prizes from Rs 1,001 to Rs 5,000 to Indian authors. Although spread of science was not their main purpose, Marathi periodicals namely, *Dnyan Prakash*, *Dnyan Chandrika*, *Vividh Dnyan Vistar*, *Srushti Dnyan* published articles on modern science including Darwin's theory of evolution, between 1840-1860. The process of coining Marathi science terminology initiated by Hari Keshavji Pathare, and Bal Shastri Jambhekar gathered momentum, between 1880 to 1900.

According to the Calcutta Book Committee, out of 4,122 books published in all modern Indian languages in 1874 only 348 i.e., 8.44 per cent were on science; of which 219 were in provincial languages; Bengal (86), Punjab (49), N W P (30), Bombay (18) and Madras (14) Out of 4,719 Marathi books published in the 19th Century only 233 (i.e., 5 per cent) were on science. On the whole religious and historical books were more popular.⁴

In 1864, Sir Syed Ahmed Khan founded the Aligarh Scientific Society (with the support of leading zamindars and officials of NWP) to encourage the use of science and technology in industrial and agricultural production. The society engaged in massive translation of science literature, held public lectures and demonstrations to convey with experiments the utility of modern technology in agriculture and industry. The society inspired the Bihar scientific society started by Imdad Ali. Though protagonists of science succeeded to some extent in creating awareness of benefits and efficacy of science and reason they failed at large against the traditionalists in the absence of public support and economic movement to boost their ideas.⁵

British Imperialism

Right from the early days of colonialism, science was considered as an important instrument of physical, cultural and intellectual subjugation of the non-Europeans. The scientific research was confined mainly to surveys of local resources for organised economic exploitation. In order to deride Indians, pre-colonial Indian knowledge of astronomy and medicine was denounced as unscientific.

British prejudice against Indians, deprived even talented Indians of higher positions in colonial administration. Western medicine projected as a humanitarian rationale for the British rule in India, was systematically used to subjugate Indian medical systems. 'Social Darwinism', a brainchild of imperialist European intellectuals, sanctioning racial superiority of Europeans over non-Europeans was readily accepted by English educated upper-castes in India.

British emphasis on liberal rather than scientific education led to the proliferation of legal and teaching professions, whereas their neglect of original research and encouragement of only need-based technical and scientific education produced more clerks, overseers and mechanics than

research scientists.⁶ Consequently, Indians felt the need for 'national science', which could respond to Indian economic, social and cultural needs in 19th century and inspire Indians by the scientific achievements of ancient India.

The resurgent Indian nationalism in science heralded by Mahendralal Sarkar, aimed at acquiring fundamental scientific knowledge, by self-help, for the growth of industry and agriculture, as well as, for social, religious and intellectual regeneration. With encouragement from Sir Richard Temple (then deputy governor, Bengal) and finance from public subscription, M L Sarkar established in 1876 the Indian Association for the Cultivation of Science (IACS), on the model of the Royal Institute of London and the British Association for Development of Science.

Although, the Indian Education Commission 1882, testified to the preference of an average Indian for clerical jobs; the Indian National Congress, supported by the vernacular press and the educated Indians endorsed the demand for technical education repeatedly, in 1887, 1892, 1898, 1900, 1909 and in subsequent years. According to Lord Curzon, India's problems were eternal and would be aggravated by the growth of unemployment resulting from wider technical education among Indians.

After the Japanese victory over Russia in 1905, Japan, the rising sun on the political horizon, served as a source of inspiration and a role model for resurgent Indian nationalism. In order to modernise Indian industry, the swadeshi movement encouraged technical education and a Calcutta-based organisation financed the advanced scientific and technical education of Indian students to Japan, the US and Europe. However the movement for education abroad widened the gulf between foreign educated technicians and local workmen, instead of producing better-equipped trainees.

The Industrial Conference and the Indian National Congress recommended national polytechnic institute and at least a technical college in each province. Nationalist educationalists like Ashutosh Mukherjee and Madan Mohan Malviya struggled to secure better position for science in the curriculum. In 1909, the Indian Institute of Science was founded at Bangalore by J Tata for instruction in applied sciences and postgraduate research.⁷

The ideas evolved during the Indian movements for spread of science were

echoed in writings and work of Balaji Modak.

Modak's Life and Work

Balaji Prabhakar Modak was born on March 22, 1847, in a Chitpavan Brahmin family, in the village Achre, taluka Malvan, Ratnagiri district of Bombay Presidency. He was distantly related to the famous Prarthana Samajist, Vaman Abaji Modak. After his father's early death, B P Modak completed his primary education at Sangli, where Dada Chhapkhane set a fertile ground for Modak's scientific career through his thorough instructions in arithmetic, geometry and trigonometry. A scholarship from the ruler of Sangli enabled B P Modak to complete his matriculation from Sardar high school, Belgaum and pursue higher education in the Deccan College Poona. Unable to appear for BA examination due to illness Modak joined Rajaram high school, Kolhapur as a first assistant teacher in July 1869. B P Modak was a tutor to prince Shivaji of Kolhapur and superintendent of the school at Kolhapur founded exclusively for Maratha nobility. Abasaheb Kagalkar and Balasaheb Mirajkar, two students from this school helped B P Modak in his later life.⁸

B P Modak strived hard to master science when he was asked to teach the subject in Rajaram high school. The turning point in his scientific career was his training in theoretical and practical chemistry under Samuel Cook at Poona Science College, while undertaking government project for distributing scientific instruments to the schools of Bombay Presidency. Here he had an opportunity to observe the working of a laboratory and conduct scientific experiments, which created a passion for science in him. After working under Cook for a second time and delivering public lectures at Kolhapur, B P Modak published his first book on chemistry (dedicated to Cook), 'Rasayan Shastra-Poorvardha' in 1876. 600 copies of this book were sold. Reviewing this book in 'Nibandhamala', Vishnushastri Chiplunkar appreciated Modak's lucid illustrations; use of experiences from daily life to explain scientific principles and his efforts to remove the dearth of science literature and science terminology in Marathi. As there was no Marathi science terminology in 1876, Chiplunkar asked the readers to pardon Modak's adulterated Marathi expressions like 'guru carborated hydrogen'.

According to Chiplunkar, the book was helpful for conducting science experiments without external guidance. The book served to free Marathi from English influence. The reviewer in 'Vividha Dnyanvistar' congratulated B P Modak for introducing successfully western science through Indian languages without leaving any trace of the foreign origin – an achievement comparable only to that of Varahamihir in ancient times. At the same time, he disapproved the adulterated Marathi expressions, inappropriate examples and inadequate explanations at certain places.⁹

B P Modak wrote/translated 43 books (38 published and five unpublished) on science, history, geography and banking. Modak's translation of Ganot's first volume of 'The Popular Natural Philosophy' was published in 'Shri Sayaji Dnyan Majusha' edited by Professor Gajjaar and financed by the Baroda government. In order to help revive the dyeing and calico printing industry, Modak wrote articles explaining their modern techniques in 'Shilpakala Vidnyan' from 1888 to 1893 under the title 'Ranga dene va chhite chhapne'. Permission was sought to translate his books in Gujarati and Kannada. When Modak translated English books, the original European authors sent him gifts as a friendly gesture. B P Modak was helped and encouraged by Chatfield, the DPI Bombay. He instructed all libraries to buy Modak's books through a circular. To keep himself abreast of latest developments in science, Modak visited Bombay and Poona regularly.¹⁰

B P Modak was appointed a lecturer in the physical/sciences in the newly opened Rajaram College in 1880 and was entrusted with its laboratory till 1900. Here he encouraged even outsiders to conduct science experiments. The Kolhapur government allowed him to work in the laboratory even after retirement. Encouraged by Abasaheb Kasalkar and Krishnaji Bhikaji Gokhale in the early stages and financed by the Kolhapur government throughout, Modak held annual science exhibitions in the Christmas vacation in Rajaram College from 1883 to 1896. The year 1896 witnessed the last and grandest exhibition in Kolhapur. Dhurandar and Kelkar from Rajaram College helped Modak organise these exhibitions; his students Govind Tembe and N C Kelkar worked as demonstrators in the science exhibitions. Thus with his efforts, he helped create a scientific ambience in Kolhapur and its vicinity; so

much so that his name became synonymous with science.¹¹

Other Activities

B P Modak was the first to compile the 'History of Kolhapur and South Maharashtra' from 1st century AD to the 1st decade of the 20th century AD. He wrote the first detailed history of the Bahamani rule in Marathi. He wrote textbooks on the geography and history of Kolhapur and the history of Muslim rule in India. For years his textbooks were prescribed in Kolhapur schools. He compiled a chronological table showing corresponding dates according to Shaka, Rajshaka, Hizri, Fasli and Gregorian calendar from 1628 AD to 1893 AD. On the orders of the Kolhapur government Modak translated the 24th volume (on Kolhapur) from the Bombay Gazette. As its secretary in 1875 and president in 1901 and 1906, he played a large role in the development of the 'Native General Library' – 'Karvir Nagar Vachanalaya'. Modak wrote a book on banking when he was entrusted with the reorganisation of the Southern Maratha Bank by the Kolhapur government. On Modak's advice, the Kolhapur government constructed an industrial museum in 1873 – out of the personal collection of a retired English engineer and appointed Modak as its director. The industrial exhibition held by Modak in 1891 prompted the industrial survey of Kolhapur, which was entrusted to Modak by Meherjibhai Kunvar, the dewan of Kolhapur from 1892 to 1895.

Although not a member of any political organisation, Modak was associated with the swadeshi shop at Kolhapur. After retirement he taught voluntarily in the Samarth Vidyalay (Kolhapur), of Vishnu Govind Vijapurkar, his past student and a propagator of National Education. His interest in mathematics and in the regeneration of Marathi brought him closer to B G Tilak and Vishnushastri Chiplunkar, respectively. Kirtikar (the deputy educational inspector and the secretary of Abasaheb Kagalkar) was a friend of Modak. In 1894-1895, the Kolhapur government appointed a committee comprising Sethna, Modak and Kirtikar to investigate school curricular problems and limited employment opportunities for the teachers in Kolhapur.

Modak worked as the temporary vice-principal of Rajaram College between 1894-1895 and retired as vice-principal in

1900. He could not be a member of the Royal Chemical Society due to financial reasons. He refused principalship of Kalabhavan, Baroda, as he did not want to leave Kolhapur. As chairman of the annual gathering of the Mumbai Marathi Grantha Sangrahalaya in 1904 he emphasised on the use of Marathi in higher education. There were unsuccessful attempts to appoint Modak as the chairman of the Kolhapur representative council in 1906. Although he spent his retired life in studying Bhagvat Geeta and Upanishads, Modak continued to write till his death on December 2, 1906. His death was mourned by leading Marathi journals namely, *Kesari* and *Dnyanaprakash* from Poona and *Vidya Vilas* from Kolhapur.¹²

Views on Education

Through his writings and his presidential speech at the Mumbai Marathi Grantha sangrahalaya in 1904, Modak discussed major educational issues namely, the need to use Indian languages as a medium of instruction for wider and faster diffusion of general and scientific education at grass roots level; the necessity to raise the standard of science education and to introduce compulsory primary and technical education.

In order to remove imbalances in education system; Modak suggested the following curricular and structural changes. According to him, at the primary level, memory-based subjects like arithmetical tables, poetry and basic grammar ought to be taught along with newly introduced subjects based on work experience, like story telling, drawing, crafts and music. Stress ought to be laid on learning the Devnagri script and good handwriting. Teaching of Indian history and Asian geography up to standard four should be supplemented by science, health and hygiene in standards five and six in vernacular schools.

He advised the Kolhapur government to introduce agriculture, drawing, carpentry and woodwork in standards, five and six of the Kolhapur vernacular schools (on the model of England, Bengal and the Central Provinces) and instructions on agriculture in the training schools for the benefit of the farmers and artisans. Hosiery, household sewing, dress making, weaving, lace-making, domestic hygiene and Indian cookery should be taught in girls' schools and pottery, weaving, clay-modelling and designing in the Kolhapur vernacular

schools. He also recommended introduction of compulsory primary education (on the Baroda model) to the Kolhapur government "for the intellectual development and the well-being of the masses and liberation of the cultivators from various problems" He appealed to Kolhapur government to increase its expenditure on education from one-third to a half of the local cess.

For the middle-level education, Modak recommended the closure of redundant anglo-vernacular schools (with English medium) by adding classes five, six and seven to the existing vernacular schools, where mathematics and natural and social sciences could be taught through Indian languages, with the addition of English language, by teachers from the closed anglo-vernacular schools. After completing high school education in Marathi, in three instead of four years, students could appear for matriculation or university school final examination through Marathi.

Further he suggested that there should be a school for every village, a high school for every taluka and a college for every district. Half the number of existing English high schools should be converted into vernacular colleges; teaching English upto matriculation level and other subjects at level of arts colleges, so that with a sound knowledge of English, students of the vernacular college could pursue professional courses. Graduates of Bombay university could be employed in vernacular colleges on half the salary of English professors. Reservation of chairs on various subjects would promote scholarship, research and literature in Marathi. Training colleges could be transformed into vernacular high schools. After examining them in methods of instruction, matriculates could be appointed as teachers in vernacular primary schools and graduates in vernacular high schools. As a result, English education would be cheaper and accessible to a larger number without the loss of cultural heritage. Better teachers, thinkers and journalists would enrich Indian languages. At the same time students from vernacular schools could secure government jobs without wasting time in the anglo-vernacular schools.¹³

B P Modak advocated the use of Indian languages as the medium of instruction in education at all levels, on several grounds. Education through English, a foreign language, required more time, energy, money, and a good intellect, which could be

fruitfully diverted to the study of other subjects, through Marathi. English being the medium of instruction, backward communities like shimpi, sutar, mali, Maratha and Muslim had to face tougher competition with Brahmins. Even the middle classes in the mofussil area could not afford expensive English high schools situated in districts. Education spread faster in advanced countries, where the mother tongue was the medium of instruction, whereas mass education suffered in India, because English was the medium of instruction.

Indian backwardness in education arrested the growth of science education and scientific research. Poor quality of education in vernacular schools discouraged original thinking among Indian masses, marginalised their political participation, affected serious discussions on politics and international affairs in the Marathi press and encouraged blind following of English-educated leaders.

In spite of being a champion of Indian languages, Modak was against the total abolition of English in education, he was aware that Indians learnt about English history and literature, parliamentary system, press, modern science, western educational institutions and world happenings essentially through English education. He advocated the coexistence of institutions teaching through English and that of Marathi and pointed out that scholars who studied English would earn international reputation while those who studied in Marathi would be instrumental in the wider and faster diffusion of knowledge.¹⁴

He lamented social indifference to the dearth of books on the natural and social sciences, the major difficulty in introducing education through Marathi, and pointed out that the condition of Indian languages in the 19th century resembled that of the European languages in the 15th century. However, the former could not progress as much as the latter because European schoolmen imbibed the spirit of science owing to Sir Francis Bacon's influence whereas the class of shastris was washed out by the tide of English education, even as attempts to introduce mathematics, science, geography and economics through Marathi in the 'pathshalas' were discontinued. The replacement of Marathi by Sanskrit at school and college level lowered proficiency of graduates in Marathi. Consequently, there were very few good Marathi writers after 1875. Moreover, the government's partial attitude to English

coupled with growing admiration of English language among Indians prejudiced Indian scholars over the ability of Marathi to express scientific knowledge.¹⁵

Attempts to teach science through Marathi and Gujarati in vernacular colleges of science and Kala Bhavan at Baroda were successful but short-lived. T K Gajjar from Kala Bhavan published books on science in Marathi and Gujarati with the aid of Rs five lakh from the Baroda government. As happened in Europe, application of Marathi in education would be followed by a spurt of books in Marathi on various subjects and not vice versa. The last decade of the 19th century was the right time to introduce science education through Marathi, since graduates of the Bombay university were available as teachers.¹⁶

Since universities in India taught through English, a foreign language, the Swadeshi movement ought to have focused on the regeneration of Indian languages, along with Indian industries. The first generation of the English educated Indians however had blundered in tolerating in India the system of English education suitable to the white colonies of England.

Modak criticised Indian scholars and the Indian National Congress for not raising the demand for using Indian languages in education, along with their political demands, till the partition of Bengal (1905). As the British government was never keen to spread scientific knowledge in India, which hindered the growth of education in general and controlled universities by legal means, he appealed Indians to shoulder the responsibility of science education and national education and thus compel the British government to change the foreign character of its educational institutions.

According to him National Education should be introduced through regional languages at primary, secondary and college level with Hindi as an additional subject. Science should be on par with mathematics in the curriculum along with instructions on industries based on physics and chemistry. Students ought to be introduced to the English scientific terminology to facilitate their higher education at home and abroad. Science education should be supplemented by instruction in Bhagvat Gita.¹⁷

In sum, Modak's educational ideas evolved over a period of time. In 1876, he stressed the need to put natural sciences on par with social sciences, in the curricu-

lum. In 1887, he advocated education through Marathi. He recommended compulsory primary education and technical education in the industrial survey of Kolhapur, 1895. After having researched curricular problems in 1895, he recommended the closure of the anglo-vernacular schools and proposed a plan for middle level education through Marathi in 1897. He spoke for the first time, about a Marathi university in 1904 and about national education in 1906. He envisaged a Marathi university 25 years before Balkrishna.

Modak and the Spread of Science

Of all his diverse activities, his attempts in spreading science stand out as his most remarkable contribution towards mass education. Modak adopted the spread of science as the mission of his life, with the conviction that India would lag behind other countries in the struggle for survival, in the absence of progress in physical science. He wrote/translated 24 books on mathematics, statistics, physics, chemistry, zoology, agriculture, health and hygiene in Marathi (when Marathi terminology was in the making) in order to facilitate higher science education through Marathi and to diffuse scientific knowledge among the public at large. In this work he readily accepted suggestions from experts and criticism from the common man. He was benefited from the suggestions of Sir Balchandra Bhatvadekar – an eminent medical practitioner in Bombay and the right hand man of Sir Phirozshah Mehta – and M V Sovani, principal of the Poona Training College as well as a matriculate like Bhausaheb Gupte.

His books spread up to date scientific information through Marathi on gases, water, electricity, magnetism, gravitation, laws of buoyancy, sound, light, winds, clouds, atmospheric pressure, metal and metal compounds, Dalton's atomic theory, hydrogen, oxygen, alkalies, crystals, public and individual health and hygiene, chemical products, medical properties of trees and animals, photosynthesis and pollination and the principles underlying the working of scientific instruments, namely, calorimeter, barometer, kaleidoscope, helioscope, spectroscope, prisms, concave and convex mirrors, camera, magic lantern, with the help of illustrations and experiments. No other Marathi writer had written earlier in such detail on a variety of subjects. Even one-fourth of the

information on sound and light given in Modak's books was not earlier available in Marathi. Owing to his voluminous contribution to Marathi science literature. G D Khanolkar called Modak the 'standard bearer' of Marathi Science literature.¹⁸

As a science writer, Modak believed that science literature in Indian languages ought to spread the most modern knowledge and information about most recent inventions along with their practical applications. Science terminology coined in Indian languages should be simple, lucid and indicative. It should be derived from Sanskrit roots, prefixes and suffixes and should be uniform to all modern Indian languages. Indian terminology should be introduced gradually and coexist with English terminology, until science education was imparted through Indian languages and Indian industries were controlled by Indians.¹⁹

Modak had to fight often against the discouragement from a section of educated people, who doubted the utility, readership and circulation of scientific literature in Indian languages. However, Modak continued to publish science books, with a missionary zeal, in spite of discontinuation of government support from the DPI, Bombay and reduced chances of financial help from the princes during famine. As Modak considered the diffusion of knowledge, a solemn duty of educated people, he tried to persuade his scholarly friends to write on subjects of their interest, in Marathi. When they pointed out financial problems involved, Modak sighted examples of medieval poets like Moropant, Waman Pandit, Mukteshwar and Tukaram, who composed poetry out of personal interest, and as a social and religious service, without financial considerations. Although he was convinced that his books, like those of medieval Marathi poets (whose poetry survived even in the absence of printing) would stand the test of time, owing to their social utility, towards the end of his life, he expressed doubts about the wider use of his Marathi books, in the absence of science education through Marathi.²⁰

Modak performed a herculean task considering India's backwardness in science in the 19th century, and general absence of scientific terminology in Marathi. Through his books on science in Marathi, he rendered yeoman's service to society and continued the tradition of Marathi scientific writing initiated by

Balshastrī Jambhekar in the early 19th century and incidentally strengthened Vishnushastri Chiplunkar's movement for 'de-anglicisation of Maharashtra' in the field of science.

On realisation that, the preponderance of history, economics and logic in the existing curriculum had resulted in a plethora of lawyers and politicians and dearth of scientists, Modak strongly advocated inclusion of natural sciences in the curricular on an equal (if not on higher) footing with social sciences right from the primary level. According to him, science based on empirical knowledge had a vital role to play in the intellectual regeneration of India, where religion seconded by superstition had divided the people into several castes and created unbounded reverence for old institutions, which discouraged the spirit of inquiry and produced intellectual stagnation.

To him, science education through Indian languages was also indispensable for regeneration of Indian industry. He pointed out that in Europe, widespread science education through modern European languages led to inventions and improvements in the European machinery and craft. As a result, superior European products captured Indian markets to the detriment of Indian industry. However, in the absence of scientific background, educated Indians precipitated the ruin of Indian industry by their preference for imported British products instead of improving existing industrial techniques. Dyeing and calico printing, a flourishing industry of the ancient and pre-colonial times, declined during the British period. It could not be revived owing to the ignorance of chemistry among dyers as well as educated Indians. As a result English dyes manufactured from Indian raw materials captured Indian markets. In the absence of science education, the Indians could neither adopt nor invent new techniques of industrial production and the British continued to exploit Indian raw materials and mineral ores. In short, without scientific background, the swadeshi movement could not and would not succeed in its major objective of reviving Indian industries. Regeneration of Indian industry being Modak's major concern, he considered the instruction in physics and chemistry more urgent than that of biology.

Modak pointed out that the neglect of science education resulted in public disinterest in science and hampered the growth of science literature in Marathi. He

criticised the DPI, Bombay for discontinuing its patronage to science literature and advised them to emulate DPI, Bengal by awarding the best Marathi science book, out of the funds of the Dakshina Prize Committee. He urged literary organisations like the Mumbai Marathi Grantha Sangrahalaya to reward Marathi science literature. He advised Indians to emulate Russia and Japan and invite foreign professors to teach science through foreign languages for the first five years, and to teach and write books on science in Indian languages for the next five years. Modak favoured moves to send Indian artisans abroad for learning modern techniques of industrial crafts. He urged the Indian princes to follow the footsteps of Abasaheb Kagalkar, Balasaheb Mirajkar and Sayajirao Gaikwad in patronising the movement for the spread of science, as they alone had resources to finance expensive science equipment and research ventures yielding no immediate financial returns.

The editor of the 'Rajaramian' (house journal of the Rajaram College) had rightly observed that although Modak was not a research scientist his contribution in spreading science cannot be trivialised owing to the significant role he played in the history of science education in Kolhapur.²¹

Science Exhibitions

In order to acquaint the public with the latest scientific inventions, Modak held annual science exhibitions. With growing public response, their scope was widened by adding new equipment from time to time. Exhibitions were widely advertised, police force was stationed to maintain law and order and free but mandatory daily entry tickets were distributed to visitors. According to the report published in 'Shilpa Kala Vidyan', the number of visitors to the exhibition of 1887, ranged between 10,000 to 12,000 per day. The first day of the exhibition was reserved for honourable guests, nobles and organisers, the second and the third day for students and rest of the days for the public. In these exhibitions, Modak displayed latest scientific machinery like X-ray machine, cameras, surgical instruments, telescope, microscope, Faraday's coil, Morse's telegraph, Edison's phonogram, water mills and automobiles and fire engines. The volunteers gave scientific information about electricity, sound and light to the visitors. Through these exhibitions, Modak intro-

duced electric lamps in south Maharashtra. Inspired by his exhibitions even his semi-literate students spread science in the other villages by demonstrating science experiments. Modak's science exhibitions extended the movement for the spread of science (started in Bombay and Poona by English educated intelligentsia) to the illiterate masses as well as to the princes of Kolhapur and Miraj and in the process they served to transform the theoretical character of the movement by introducing scientific experiments having demonstrative effect.²²

Initially, it was Abasaheb Kagalkar (the Regent of Kolhapur) who provided entire financial assistance to Modak's science exhibitions. Inspired by Modak, Kagalkar often used to conduct science experiments. He furnished the common laboratory of Rajaram high school and Rajaram college with scientific instruments purchased during his annual Bombay visits along with Modak. He presented the laboratory with expensive scientific instruments including a binocular costing Rs 1,000 purchased during his visit to England in 1883.

Gangadhar Patwardhan alias Balasaheb Mirajkar, the prince of Miraj and a student of Modak, was his sole assistant in the early exhibition. On Modak's inspiration, he wrote 'Mutra Pariksha' and 'Rasayana Shastra' (dedicated to Modak) and opened 'Ganesh Kala Grih', a laboratory at Miraj with expensive scientific instruments, (which he donated later to the Deccan Education Society, Poona). Mirajkar delivered public lectures on science and employed US trained technicians to promote dyeing industry in Miraj. He financed the publication of Modak's translation of Ganot's volumes on electricity, magnetism and heat. He conducted experiments in the 'Ganesh Kala Grih' on Modak's articles on dyeing and calico printing published in 'Shilpa Kala Vidyan'. However, a book based on these articles could not be compiled due to Modak's sudden death. Thus Modak's efforts in motivating the princes of south Maharashtra, to patronise the movement for the spread of science bore concrete results until his death.²³

Modak conducted an industrial survey of Kolhapur, the first of its kind in Maharashtra, at the instance of the Kolhapur government. Inspired by the industrial and mineral wealth of the state and its potential for development, Modak presented a report on industrial conditions in Kolhapur

and his scheme of fresh survey at the Poona Industrial Conference of 1892. For the survey, he collected information about the existing industries in the territory through village and district agencies by distributing a simple questionnaire, and got the data checked through educational inspectors, head masters and school masters. He travelled extensively for the survey on an average of 13 miles per day visiting even localities with natural mineral deposits and forests as well. He motivated even the illiterate people to cooperate by explaining the purpose of the survey.²⁴

He analysed problems faced by various industries like cotton and blanket weaving, tanning, parched-rice making, oil-processing, sugar refining, dyeing, lacquer work and bangle making and suggested measures for improvement. For the weaving industry, he recommended grant of loans to artisans and provision of capital at a low interest rate of 6 per cent. In order to encourage Shahapur weavers to migrate to Kolhapur, for training local weavers he proposed grant of government incentives. He put forth the idea of establishing 'central shops', subsidised partly by the government and funded partly by people in the form of shares, to be managed by mamledars, at large centres where weavers and artisans could buy their raw materials and sell finished goods. Profits of the state could be utilised wholly or partly, for the training of weavers and purchase of expensive looms. In order to improve the lot of the sugar industry (ruined by the imposition of British tax on Indian sugar exports and the discovery of beet sugar in Europe) he suggested provision of better seeds and establishment of a large sugar factory based on the English or Mauritius model. His suggestions for other industries were: employment of trained potters from Calcutta and Jaipur, improvement in cattle breeding, and bark cultivation for colouring leather. He proposed agro-based industries to generate rural employment, use of better agricultural implements, better irrigation and transport facilities and training of artisans. He recommended cultivation of bamboo (for fibre), mulberry trees (for silk), coffee, tea, pepper and cardamom on the lines of Mysore state. As a champion of the swadeshi movement, he condemned the import of foreign goods, which ruined indigenous industries. He advised the export of groundnut oil instead of groundnut. He suggested the use of small hand presses for extracting linseed

oil and castor oil. He welcomed the establishment of oil mills. He highlighted grievances of Dhavads (metal workers), the major suppliers of implements for animal husbandry and war weapons.²⁵

He strongly advocated the adoption of modern technology in agriculture and industry, citing the success stories of other countries. He recommended the introduction of centrifugal machines for sugar manufacture, replacing, manually operated vacuum pan used for sugar crystallisation.²⁶ He supported justice M G Ranade's suggestion for a bank on European model, for the development of agriculture and industry, but did not wish to displace traditional creditors or marwaris altogether. Modak was opposed to monopolies and favoured government support for the development of industries.

'Kesari' (the journal edited by B G Tilak), in its review of the industrial survey report, congratulated the Kolhapur dewan for the industrial survey, a venture not attempted hitherto even by the British government. It appealed to the Kolhapur government to honour Modak for his valuable contribution, in this regard.²⁷

Modak the Historian

Modak, the science teacher turned to history when he was asked to teach the children of Maratha nobles, the history of their illustrious forefathers. Since Graham's report on Kolhapur was outdated, Modak chose to compile a fresh history of Kolhapur critically analysing Bakhars, Vakas (the personal daily accounts of Maratha nobles), and the material from Kolhapur archives, English books, articles and reports. Modak gathered information on the revenue system, the civil and criminal administration of Kolhapur, main occupations followed in the Kolhapur state and the principalities, the events leading to the foundation of the Kolhapur state, its relation with its vassals, its well known kings and forts. The remuneration of the clerk who copied the archival material was paid by Abasaheb Kagalkar. Since material on the Patwardhan (who ruled the principalities of Kolhapur) was easily available. The fourth volume, consisting of their history was published before the second and the third volume based on the Bahamani and Bhosla rule appeared in Kolhapur. He appealed to the princes to furnish him with their family chronicles, documents and historical legends about the great men of their dynasty to correct

inaccuracies in his writings. In order to write history of Kolhapur, Modak toured south Maharashtra extensively for eight to ten years collecting source material and old legends. He was able to overcome the general unwillingness to show personal records and the hesitation of the old people (due to their mockery by English educated youth) to narrate the heroic stories of the Maratha nobles. These pathbreaking books on the history of Kolhapur drew attention of several scholars on the history of Shivaji's descendants at Kolhapur, that had been forgotten with the rise of peshwas in the 18th century, Modak is known in Kolhapur at present more as a historian than as a propagator of science.²⁸

Aping the style of a government gazette, Modak wrote an introduction of 102 pages to the first volume of the history of Kolhapur and south Maharashtra, describing the topography, flora and fauna, markets, dispensaries, prisons, post offices, police administration, means of communications and languages spoken in Kolhapur, and its principalities. Modak wrote the ancient history of Kolhapur with the help of inscriptions and English books; Bahamani history from English translations of Farishta's accounts and books of Elphinstone and Elliot. His main source for the history of the Adil Shahi was the Marathi translation of 'Busatin-I-Salatim'. According to Modak, the knowledge of Bahamani history was essential to trace the causes for the rise of Marathas and the socio-cultural transformations witnessed in the Deccan during the medieval period. He covered the history of Delhi sultanate and of the Mughals in his textbook 'Muslim Rule in India'. Modak was perhaps the only Maharashtrian who wrote extensively on the Bahamani rulers and Mughals in Marathi.²⁹

While compiling the Kolhapur history of Modak felt the need of a chronological table in order to synchronise dates from various calendars. He found a chronological table with corresponding dates for Hizri, Shaka and Gregorian calendar from 1723 AD to 1855 AD compiled by Antaji Janardan Namjoshi and Ramchandra Narayan Pakhale in the Kolhapur archives. By comparing them with the tables of Vishnu Balaji Bhedsamgavkar, and Narayan Balkrishna Godbole, Modak rectified the mistakes in the tables of Namjoshi and Pakhale who wrongly assumed the year 1800 AD as the leap year. Modak published a chronological table from 1723 to 1894, which was revised after his death

by his son Vishwanath Balaji Modak. His table was extremely useful to historians and lawyers, although Balvant D Apte later corrected a few errors in Modak's table regarding the Hizri and intercalary months.³⁰

Views on History

Modak's history books reveal his ideas on history and politics. His wider perception of history is evident from his argument that the complete history of a period cannot be compiled without information about trade and defence system, average expenditure of a family, extent of foreign contacts, means of transport and communications, imports, amount of rainfall and nature of crops, extent of popular support for the king, status of various classes in politics, conflict (if any) among various religious groups.³¹ Modak's detailed description of the socio-economic conditions during the Chalukyan and Bahamani period along with the analysis of the war technology was pathbreaking in the 19th century, when Indians had just been introduced to modern techniques of historiography, and the concept of social history was in the making, even in Europe.

Modak's advocacy of a benevolent government is evident from his criticism of the Bahamani rulers for not helping citizens during the 12-year famine. His elaborate description of the doctrines of the Lingayat and Mehdi sects was instrumental according to him in the downfall of the Chalukyan and the Nizam Shahi rulers, respectively; the role played by the racial and sectarian conflicts among the Muslims in shaping Mughal and Bahamani politics reveal Modak's grasp of the role of religion in directing medieval politics. His balanced judgment is evident from his references to the benevolence of Mahmud Gazni to this kingdom of Gazna and Aurangzeb's sound administration, bravery and simple habits along with references to Gazni's plunders and Aurangzeb treacheries and bigotry. As a nationalist from M G Ranade's generation, Modak viewed history as an instrument of inculcating nationalism among the youth, during the colonial period. However, his appreciation of Akbar and Muhammad Gavan testify that he did not allow nationalism to degenerate into communalism.³²

As a historian Modak regretted the absence of historical sense among Indians, their indifference to European research on

Indian history and the dearth of historical journals in Indian languages. He appealed to Indian historians to set up societies and publish history periodicals in Indian languages. He advised editors of journals in Indian languages to compile books from the series of articles on history published in their journals. He criticised the shastris for their ignorance of western analytical methods in interpreting Sanskrit literature and modern Indian scholars for neglecting classical languages other than Sanskrit. He stressed the need to study Persian language and to collect Persian books for studying medieval history. He appealed to Muslims to save Persian from decline resulting from the loss of the state patronage. He criticised the British government for spending their resources solely on administration and defences to the negligence of scholarly pursuits.³³

Modak was an 'avant-garde' in many respects.³⁴ He expounded technical and scientific education through Indian languages, when primary education was not free and compulsory even in British India. He envisaged a Marathi University when the sharpest Marathi intellectuals were demanding the inclusion of Marathi language as only an optional subject in the university curriculum. He took into account socio-economic factors in evaluating historical events, more than 75 years before Marxian interpretation gained currency in India. Himself a product of the 19th century renaissance in Maharashtra, he tried to shift its exclusive emphasis from social and political movements to the spread of science. In fact, he was the major exponent of the translation movement in science literature in Maharashtra in the 19th century. He applied Vishnushastri Chiplunkar's movement of de-anglicisation to science literature. He also awakened the princes of south Maharashtra to play their due part in the movement for the spread of science. By his penetrating grasp of an issue and the application of scientific method, Modak broke new grounds even in history and economics, subjects not of his regular pursuit.

Although no evidence can be traced so far, of Modak's direct contacts with non-Maharashtrian propagators of science (except T K Gajjar of Baroda), the striking similarities between his ideas and work with his counterparts in Bengal and elsewhere present him as an active Maharashtrian representative of the wider all-India scientific community of the period.

Like Mahendralal Sarkar, Modak realised the British reluctance to promote science education and research in India and stressed the need for an Indian initiative in this respect. However, unlike Sarkar, who tried to bring together scientific community of Bengal through his Indian Association for Cultivation of Science (IACS), Modak's individualistic efforts in Kolhapur and the vicinity hardly evoked a substantial response in scientific circles of Bombay and Poona. He proved a loner, without followers to keep alive his tradition.

In translating science books in Marathi, he continued the work of his Maharashtrian predecessors as well as propagators of science from Bengal, Baroda and the United Provinces. It is a pity that his textbooks were not revised afterwards. He resembled Sir Syed Ahmed Khan and his Aligarh Scientific Society, in holding science exhibitions, but whereas Sir Syed Ahmed Khan got financial support from the landlords of NWP, Modak drew patronage from the princely states of Kolhapur and Miraj.

In his advocacy of Indian languages as medium of instruction, he was directly inspired by the Baroda school of T K Gajjar. Modak was, however, opposed to the Benaras school, which favoured Hindi as the medium of instruction throughout the country.

The trend of revivalist nationalism of the late 19th Century had influenced also the scientific community of the period. Pramath Nath Bose, a geologist, wrote 'A History of Hindu Civilisation' in 1896; Prafulla Chandra Ray, a chemist, wrote 'History of Hindu Chemistry' in 1909. Modak, a science teacher, compiled 'History of Kolhapur' to educate the young generation about the past Maratha glory. As with Pramath Nath Bose, Modak tended to hold Muslim rule in Delhi responsible for the general degeneration of Hindus. Like P N Bose, Modak desired the marriage of modern science with Indian cultural values. Like the Bengali supporters of the Swadeshi movement, Modak looked to Japan as a role model for modernisation and believed in Indian industrialisation through application of modern scientific techniques evolving out of widespread scientific education and higher scientific training of Indians abroad.

In spite of his penetrating vision and outstanding contribution to the renaissance in Maharashtra, Modak is comparatively unknown to the scholars on modern Maharashtra for several reasons. He played

no active part in the social and political movement, the major concern of historical research on modern Maharashtra. The main field of his activities was Kolhapur, the capital of a princely state, away from Bombay and Pune, the centres of modernisation in the 19th century in the Marathi speaking region. More of a propagator of science than a research scientist, Modak was forgotten even by the scientific community. Bereft of any scientific inventions to his credit and a group of dedicated followers, Modak failed to leave a long-lasting movement after him. The movement for science education through Indian languages, the mission of Modak's life received a blow, with the failure of the translation movement and its purpose of equipping Indian languages with the most modern scientific knowledge. This was sadly due to the absence of general literacy and lack of industrialisation as well as, the preference given to liberal education over scientific and technical education at government and public level. [27]

Address for correspondence:

Abhidha S Dhumatkar
3/62, Gomantak Society
Mahant Road Extension
Vile Parle (E)
Mumbai 400 057

Notes

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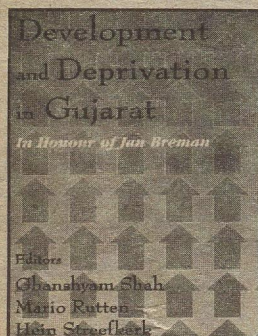
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- Rural and urban labour relations
- The causes of deprivation and modes of protest amongst the subalterns
- The causes and consequences of migration, both internal and international

THE CONTRIBUTORS

- Harshad Desai
- Kiran Desai
- Miranda Engelshoven
- David Hardiman
- Douglas E Haynes
- Indira Hirway
- Satyakam Joshi
- Uma Kothari
- Chandu Maheria
- Parita Mukta
- Pravin J Patel
- Sujata Patel
- Stany Pinto
- Shalini Randeria
- Mario Rutten
- Amita Shah
- Ghanshyam Shah
- Hein Streefkerk
- Piet Terhal



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B-42, Panchsheel Enclave, Post Box 4109, New Delhi 110 017, Tel/Fax: 26491290; e-mail: bookorders@indiasage.com • Ground Floor, 59/5, Prince-Baktiar Shah Road, Tollygunge, Kolkata 700 033, Tel: 4172642, 4220611; e-mail: sagepcal@vsnl.net • 11, Saravana Street, T Nagar, Chennai 600 017, Tel: 4345822, 4348132, 4326265; e-mail: sageind@md4.vsnl.net.in • 31, LB Stadium, Post Box 131, Hyderabad 500 001, Tel: 3231447, 3230674; e-mail: sageind@vsnl.net • 1187/37 Ameya, Shivajinagar, Off Ghole Road, Pune 411 005, Tel: 5513407, 5513408; e-mail: sageindia@vsnl.net