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## Sketches of Science Popularization Movements in Pre and Post Independent India

The paper discusses about science popularization movements in pre and post independent India. Early efforts in pre-independent India were made by educators, teachers and science workers. Srirampur College established in Bengal in 1818 probably initiated first public demonstration of modern science in India through public lectures accompanied by experimental demonstrations by its teachers. Besides popular science lectures, initial science popularization efforts included translation of science books in the vernacular and writing of popular science articles. Father Eugene Lafont of St. Xavier's College played a pioneering role in the field of science popularization in the second part of the nineteenth century. The establishment of the Indian Association for the Cultivation of Science is an important step in the history of science popularization. Like it was in the then Bengal science popularization movements also took place on other parts of India like in Assamese, Oriya and Punjabi speaking regions. Mobilization for science popularization then took institutional forms as number of notable organizations came into existence as a result of the mobilizations for science popularization. The Dawn Society, Kolkata; the Punjab Science Institute, Lahore; and Vigyan Parishad Prayag, Allahabad; Orissa Bigyan Prachar Samiti, Cuttack; and later on Marathi Vidyan Parishad, Mumbai; etc are examples of such institutions. Indian Science Congress and the science academies played important roles in post-independent India. Jawaharlal Nehru, the first Prime Minister, had put lots of emphasis on spreading scientific temper in India. Science and technology policies of the government reflected Nehru's vision. Suitable institutional frameworks were created. Of late Non-governmental organizations (NGOs) in large scale are playing crucial role in taking science to the masses. People's Science Movements have emerged as an important dimension of science popularization movement in India.

**Keywords:** Science popularization, Rationalism, Scientific temper, Science Policy Resolution, People's Science Movements.

### Introduction

Science popularization activities in India began even before modern science took roots in the country. The early efforts towards science popularization in India were initiated by educationists, science teachers in schools and colleges and professional scientists. The early science popularization in India started in 19<sup>th</sup> Century Bengal (then undivided). The Hindu College (which was later renamed as Presidency College in 1855) was established in 1817. Henry Louis Vivian Derozio (1809–1831) who taught at the Hindu College emancipated the minds of many Indian students and created an atmosphere of learning through discussion and debates. He criticized orthodox social practice and religious beliefs. He advocated the spirit of rationalism. His influence persisted long after his death and his followers came to be known as Young Bengal (Dasgupta, 1999: 22–23). He emancipated the minds of his Indian students and his role in inculcating the ways of rational critical inquiry was really profound. The first Indian

college for higher education including the study of European science was the Srirampur (also spelt as Serampore) College in Bengal. It was established in 1818 by three missionaries namely William Carey, Joshua Marshman and William Ward. The College not only arranged lectures on scientific subjects but also published scientific books and articles in their periodical named *Dig-Durshan*. It built a laboratory, a museum and an observatory. The popular scientific lectures delivered by one of its most outstanding teachers John Mack (1797–1845) in Kolkata and Srirampur perhaps can be considered as the first public demonstration of modern science in India. The lectures accompanied by practical demonstrations used to be attended by students and other citizens (Biswas, 2001: 13–14).

Raja Rammohun Roy (1772–1833), a scholar and social reformer, advocated the spread of modern science in India and also advocated for narrowing the ‘gap in attitude towards science and technology between India and Europe’, noted Naralika (2003: 88–104). In 1823, Raja Rammohun Roy wrote to Lord Amherst, the then Governor General of British India, advising him to provide modern scientific education to Indian masses. He further wrote that, ‘the Sanskrit system of education would be best calculated to keep this country in darkness, if such had been the policy of the British legislature. But as the improvement of the native population is the object of the government, it will consequently promote a more liberal and enlightened system of education embracing mathematics, natural philosophy, chemistry and anatomy with other useful sciences’ (Naralika, 2003: 90). He also fought for removing unscientific beliefs prevailing in the society like caste division and *sati* system (the practice of widowed woman immolating herself on her husband’s funeral pyre). In this sense Raja Rammohun Roy was one of the earliest exponents of scientific outlook (or scientific temper as Jawaharlal Nehru would call it later) in the India society.

Science popularization efforts in late-nineteenth century Bengal were carried out by a number of individuals. Ramendrasundar Trivedi (1864–1919) played a very important role (Chakraverti, 2000: 76–88). He began his popular science writing in 1884. The themes of his popular science articles included debates concerning the age of the Earth, the wave theory of radiation, atomic theory, the possibility of cosmic catastrophe, gravitation, light spectrum, the laws of thermodynamics. He also wrote on the scope, method and spirit of science. His articles appeared in literary Bengali magazines and they were later compiled in book forms, namely *Prakriti* (Nature) and *Jigmasa* (Enquiry). Santanu Chakraverti (Chakraverti, 2000: 82–83) while commenting on the significance of Ramendrasundar Trivedi’s popular science writing wrote that, ‘Ramendra’s popular science writings acted as a source of inspiration for his younger contemporaries. It was evident from the famous science popularizer Jagadanada Ray’s statement that he looked upon Ramendrasundar as a mentor and teacher in the sphere of science writing in Bengali. One must also refer to S. N. Bose’s statement that Ramendra’s staunch commitment to writing and reflecting on science in the vernacular served as an ideal and guideline for the *Bangiya Bigyan Parishad*. Indeed, generations had learned to delight in science from their reading of *Prakriti* and *Jigmasa*. These became for Bengali reader what the popular expositions of Helmholtz, Tait, Tyndall, Clifford and Mach had been for European readership.

Rajendralal Mitra (1822–1891), the well-known nineteenth century Bengali orientalist and intellectual played a pioneering role in popularization of science in Bengal (Ghosh, 2000: 66–75). There were attempts of popularizing science through translation of science books in the vernacular. Master Ramachandra (1821–1880) taught then in Delhi College (later renamed as Zakir Hussain College), did pioneering work in this respect. He was an Urdu journalist, mathematician and educationist. He translated mathematics and science books to Urdu (the *lingua franca* of northern India including Punjab) under the aegis of the Ver-

nacular Translation Society, which was established in 1843 (Habib, 2010: 281–292). Master Ramachandra also wrote articles on inventions, discoveries and research in modern science and on different aspects of mathematics. Master Ramachandra was himself an established mathematician. His work on mathematics entitled ‘On the Problems of Maxima and Minima’ was published in London and which included an introduction by Augustus de Morgan. The work started by Ramachandra was further expanded and taken to greater heights by his student Munshi Zakaullah (1832–1910) (Habib, 2000: 132–145). Zakaullah like his illustrious teacher undertook the tasks of translation of science books in Urdu and original writings on different aspects of science. Zakaullah was a strong supporter of teaching in the vernacular. He even argued for ‘the constant use of English even from our childhood, so that we begin to express our thoughts in English instead of in our mother tongues. It may go far to denationalize us. But if we wish to remain as Eastern people, we must not neglect the language which we learnt at our mother’s knee... To forget it, or to despise it, is to lose one of the strongest factors in the building up of national character’ (Habib, 2000: 137). The tasks of translations and writing popular scientific articles were taken up in many other languages, in pre-independence India particularly in Hindi (also in Tamil, Malayalam, Assamese and Oriya).

In the Tamil speaking region then under Madras Province, the Madras School Book and Vernacular Literature Society established in 1870s by revamping the earlier Madras School Book Society (established in 1820s) took up the task of bringing out science books in Tamil and spreading the message of modern science (Venkateswaran, 2011). Little later in Madras Presidency many scientific and literary societies had emerged in pre-independence India e. g., Villapuram Literary Society (established in 1882) and Villapuram Educational Society (established in 1885) (Venkateswaran, 2011: 42). These societies created a much needed platform for discussing literature and scientific subjects with a view to bringing about educational and social reforms.

In Assamese speaking region, the first Assamese newspaper-cum-science magazine named *Orundoi* started in January 1846 at the Sibsagar Mission Press. It devoted among other things to religion, science and general intelligence which went a long way to widen the horizon of minds of Assamese speaking people. Later on the Cotton College established in 1890 in Guwahati, Assam, provided a platform to science popularization activities in the state of Assam through popular lectures, demonstrations and exhibitions (Phukan, 2000: 146–152). But in some other Indian languages science popularization efforts started only in post-independence India.

### **The efforts in science popularization in pre-independence India**

The St Xavier’s College Calcutta, which was established in 1860 by the Belgian Society of Jesuits, played an important role in creating public interest in science and promoting science education in schools and colleges. This had been possible because of Father Eugene Lafont (1837–1908), who joined the St Xavier’s College on 7<sup>th</sup> December, 1865. Father Lafont gave his first popular scientific demonstration to the public of Kolkata on September 18, 1868. This was a great success. It was widely reported in the daily newspapers. According to some reports Father Lafont’s demonstration ‘clearly showed how attractive a really good course of popular scientific lectures abundantly illustrated with equipments, would be to the inhabitants of Calcutta’ (Biswas, 2001: 24–44).

The establishment of the Indian Association for the Cultivation of Science (IACS) at Kolkata (then Calcutta) in 1876 can be regarded as a hallmark in the history of scientific research and science popularization in the country (IACS, 1976). Dr. Sircar in his article entitled “On

the desirability of a national institution for the cultivation of sciences by the natives of India” published in the *Calcutta Journal of Medicine* (Vol. 2, August 1869, p. 286–306) in 1869, first proposed the establishment of such an institution. He in fact desired a different institution altogether which shall be for the instruction of the masses, where lectures of scientific subjects will be systematically delivered not only through illustrative experiments performed by the lecturers, but also by inviting the audiences taught to perform themselves. He further wished that this Institution be entirely under native management and control. This was claimed not out of vanity but simply that the value of self-reliance may be learnt in matters of science without any serious risk’ (Biswas, 2001: 175–176).

Further elaborating on the strategy to be adopted by the Association for disseminating a taste of science among the masses Sircar (Kumar, 1995: 198–199) further wrote that ‘they shall be able to institute two series of lectures on each subject, one general for the general public, and the other a special one for the instruction of few who would like to form themselves into a class to learn the subject. There shall have in each section under the head worker, a few sub-workers as it were, who by virtue of the training they were to receive, would soon become workers in science themselves, and would be of help to the institution as well as to community in general. Thus a taste for science will soon be disseminated among the general community, and science would then have its votaries by hundreds of thousands’ (ibid).

The IACS was the first scientific research institution started by Indians. The initial activity of the institute was to organize popular lectures on different topics of natural sciences. Father Eugene Lafont (1837–1908) started the first course of lectures in 1887 and continued till 1893. Father Lafont who taught physics at the St Xavier’s College for 43 years was a great popularizer of science. Among his students was Jagadis Chandra Bose, the first scientist in modern India. Father Lafont was also the co-founder of the IACS (Biswas, 2001: 45–68). Commenting on his popular science lectures, Ruchi Ram Sahni (1863–1948) a pioneer of science popularization in pre-independence India wrote that, ‘he will never forget the wonderful popular lectures of Father E. Lafont of the St Xavier’s College. There were other lecturers also who appeared on the platform now and again, but in making a difficult point crystal clear and especially in creating popular interest in science, no one could match the Jesuit Professor’ (Sehgal and Mahanti, 1994: 9). Among others who delivered popular science lectures at the Association were: Mahendra Lal Sircar (1833–1904), Asutosh Mookerjee (1864–1924), Jagadish Chandra Bose (1858–1937), Pramathanath Bose (1855–1934) and Nil Ratan Sarkar (1861–1943).

After the establishment of the IACS, efforts were made in other parts of the country to establish such kind of institutions for spreading the spirit of science.

The *Dawn Society* of Bengal was established in 1902. Its founder was Satishchandra Mukherjee, an eminent educationist. The *Dawn* magazine, started in 1897, became the mouthpiece of the Society was even older than the Society. The magazine served as an important vehicle in transmitting scientific ideas by publishing science articles. As Palit (2000: 90–91) notes that by 1912 the magazine published 40 articles illustrating the progress of science and its applications including “Material triumph of science,” “Wireless telegraphy,” “Right pursuit of physical sciences considered from the point of view of individual as well as national regeneration,” “Is matter alive: some of the researches of Jagadish Chandra Bose,” “New alchemy,” “Chemical research in Bengal,” “Indian metallurgical knowledge” etc. Eminent scientists and educationists like Jagadish Chandra Bose, Acharya P. C. Ray, Ramendrasundar Trivedi and Nilratan Sarkar were associated with the *Dawn Society*.

The Punjab Science Institute established in 1885 in Lahore, Punjab of the undivided India was directly influenced by the model of the Indian Association for the Cultivation of Science,

Calcutta. Though the idea of establishing such an organization for science popularization at Lahore was first conceived by Professor J. C. Oman of the Government College of Lahore it was Ruchi Ram Sahni who was instrumental in establishing the organization. The fact that Sahni was inspired by the example of the IACS Calcutta, was noted by Sahni himself in his *Memoirs* (Sehgal and Mahanti, 1994: 68). Sahni wrote that, 'the idea of the Institute originated with Professor J. C. Oman of the Government College; when he was then in M.A. classes at the College and before he had proceeded to Calcutta, he used to discuss with friends the need and scope of such an institution. But it was only in summer of 1885, (say, after Sahni returned from Calcutta and explained to Professor Oman what he had seen in the Sircar's Institution) that a Society under the name of the Punjab Science Institute was actually established.'

Sahni organized popular science lectures under the aegis of the Punjab Science Institute for laypersons on subjects like: "How does the telegraph wire speak," "The common flame," "The water Lahoris drank before 1880," "Pure and impure water," "The toys and their lessons," "Soap making," "Electroplating," "Electricity in the service of man," "Glass making", "The Punjab and its rivers". Lectures on the latest scientific discoveries namely "X-rays," "Edison's Phonograph" and "Wireless telegraphy" were also delivered. Sahni himself delivered most of the popular lectures arranged by the Punjab Science Institutes but he also persuaded many teachers in the colleges to come forward to share the activities of the Institute. According to some estimate Sahni himself delivered more than 500 popular science lectures in Punjab (Virk, 2000: 125–131). Popular science lectures organized by the Punjab Science Institute were not delivered in any special theatre or auditorium. They were delivered in open spaces. In Lahore Sahni used the compound of a Gurdwara (Baoli Sahib Gurdwara). The audience for these lectures in Lahore consisted mostly shopkeepers from the surrounding market and office workers mostly clerks. Lectures were organized in smaller towns and villages on the occasion of festivals and fairs. These lectures were often accompanied with experimental demonstrations. Sahni in 1880s was able to demonstrate that the local language, Punjabi could be successfully used as a vehicle of scientific ideas. Sahni admitted that there was no dearth of volunteers from the audience to provide suitable Punjabi work for a scientific term in English. In this way an unwritten dictionary of technical terms in Punjabi was created. Unfortunately even after 120 years of such successful demonstrations science communication in local languages including Punjabi is far from satisfactory. All the expenses for these lectures were covered by the fees charged for them. There was so much enthusiasm for such popular science lectures that Sahni received invitations for giving lectures from far flung areas. There was a direct impact of these popular lectures on science teaching in schools.

Similarly, the Orissa Science Association was established at Cuttack in November 1921 through the initiatives undertaken by professors of Ravenshaw College and Cuttack Medical College. The society did not survive long but it had initiated science popularization activities in the state. The Orissa Science Association was followed by the Bigyan Prachar Samiti. On August 7, 1949 Orissa's first society for popularizing science called as Orissa Bigyan Prachar Samiti (OBPS) was established at Cuttack for the Oriya speaking people (Pattnaik and Sahoo, 2006: 211–214). This society was formed with combined efforts of late Gopal Chandra Pattnaik and Gokulananda Mohapatra. In the first meeting of the Samiti the other members present were eminent economist Sadasiba Mishra, noted psychologist Radhanath Rath, plant scientist Shymananda Pattnaik, and professors of medicine like Mahendra Chandra Mishra and Raikrushna Mohanty. In all nine members were present in the first meeting and among them six were from Ravenshaw College and three others from medical college, Cuttack. To begin with, it was known as Utkal Bigyana Parishad but later it changed its name to Orissa Bigyan



Prachar Samiti. This society was registered as a formal organization in 1961. The Samiti during its inception had three objectives, such as; (i) Spread the messages of science through discussion forums and popular lectures in vernacular language, (ii) Publication of books based on science in vernacular language and finally (iii) Publication of a popular science magazines (Pattnaik and Sahoo, 2006: 211–214). Besides, the chief objective of the society was to provide a comprehensive language (terminology) and style suitable to students and common people to study science. Their sole aim was to make science simplified for the people and students in particular as it was so intricate. In 1944, Oriya was made the medium of instruction in schools. Exactly on that year science was introduced into the high school curriculum. But as there was not a single science text book in Oriya language the students were faced with a lot of difficulties. In view of this the OBPS desired to publish Oriya text books on science. Probably because of the absence of text books in vernacular medium students in the then Orissa showed a little interest in science. With a view to mitigating the plight of science education on Orissa then, Gokulananda Mohapatra along with Harihar Pattanaik published the first Oriya book on science for matriculation students which were frowned upon by some of the college teachers of the time. Those years in Ravenshaw College large number of students enrolled in Arts departments but a few in Sciences.

However, after the ten years of establishment of OBPS the government of Orissa recognized their contribution and recognized as an educational society. The OBPS did not deny funding offer made by the government on its own. As a result, a few education ministers have extended financial help to the OBPS. It is interesting to note that Orissa Bigyan Academy (OBA), now a government organization to propagate science originated from the OBPS. In the absence of a regular office usually the meetings of OBPS were held in the private quarters of its members. In one of its meeting OBPS gave birth to Orissa Bigyan Academy (OBA) not only for science propagation but also to perform many other activities that were not done by the OBPS (Pattnaik and Sahoo, 2006: 211–214).

The IACS Calcutta also influenced many individuals to engage in science popularization. Many well-known scientists not only took part in the activities of the IACS but they also made individual efforts in popularizing science. Jagadish Chandra Bose (1858–1937), besides being one of the pioneers of modern science in India, contributed to the field of science popularization. He wrote a popular science book in Bengali too. This book entitled *Abyakta* (Unexpressed) was a compilation of his popular articles and it dealt with life processes of plants. He also wrote one of the earliest science fiction stories in Bengali. The Institute started by him, now known as the Bose Institute, started the practice of popular science lectures since its inception.

Prafulla Chandra Ray (1861–1944), the founder of the school of modern Chemistry in India also wrote popular science articles. C. V. Raman (1888–1970), the only Indian Nobel Laureate in science, made significant contributions in the field of science popularization. He could hold his audience spellbound during his popular science lectures (or performances as he called them). His popular science lectures were always accompanied by lively demonstrations. Throughout his life Raman delivered lectures to diverse audiences. He was at his best when delivered popular science lectures. Raman also gave radio talks. The texts of his nineteen lectures were brought out in a book form. The book was entitled *The New Physics: Talks on Aspects of Science* and it was published by the Philosophical Library of New York. K. S. Krishnan (1898–1961), co-discoverer of the Raman Effect, wrote popular science articles in Tamil.

The Indian Science Congress was established in 1914 to advance the cause of science in India. It was founded by P. S. MacMahon of the Canning College, Lucknow and J. L. Simonsen of the Madras Presidency College (Visvesvaraya, 2003). They were supported by the well-known scientists of India. The Asiatic Society played an important role in sustaining the Indian

Science in its formative years. The founders of the Indian Science congress recognized the need to spread the message and spirit of science amongst the general public. A special section called "Science and Society" was created for discussing issues interfacing science and society. Asutosh Mookerjee in his Presidential address to the first Session of the Indian Science Congress held at Kolkata in 1914 said that, 'it is now more than two years that Professor MacMahon of the Canning College at Lucknow, and Professor Simonsen of the Presidency College at Madras brought forward a proposal for the foundation of an Indian Association for the Advancement of Science. The objectives and scope of the proposed Institution were stated to be similar to those of the British Association for the Advancement of Science, namely, to give a stronger impulse and a more systematic direction to scientific enquiry, to promote the intercourse of societies and individuals interested in Science in different parts of the country' (Mookerjee, 2003: 1–2).

The General Presidents of the Indian Science Congress emphasized the need of creating scientific awareness in the society. Excerpts from the speeches of two early General Presidents of the Indian Science Congress reflect its initial concerns. W. B. Bannerman was the General President of the second Indian Science Congress held at Madras in 1915. In his Presidential address entitled "The importance of knowledge of biology to medical, sanitary and scientific men working in the tropics," he stressed the need of removing ignorance of the common people vis-a-vis recent developments in biological and medical sciences. He asked (Bannerman, 2003: 6) 'if these things are so, if the cause of all these scourges and the proper measures necessary to take to prevent them are known, how is that so many thousands still die of these diseases, and that certain parts of the country still remain barely habitable on account of their presence.' He answered it himself by saying that the cause is a very simple one that is; 'ignorance, gross ignorance.'

P. C. Ray in his Presidential Address in the 7<sup>th</sup> Indian Science Congress held at Nagpur (1920) said that, 'while the study of Science is essential for material advancement, it has a special need and significance for the culture of Indian youth. A long period of intellectual stagnation...had produced in us a habit of dependence on the authority of the *shastras*. Reason was bound to the wheel of faith and all reasoning proceeded on assumptions and premises that were open to public questioning or criticism. Intellectual progress was handicapped under these conditions and it is no wonder that India cannot point to any notable achievement in this line during the 1,000 years that preceded the advent of British rule. Reason had thus to be set free from the shackles. And the function of science in achieving this end is undisputable. Science takes nothing in trust but applies to them all the methods of investigation and criticism. One may look forward to the growth of this scientific spirit in this country to liberalize the sphere of intellects' (2003: 92).

Vigyan Parishad Prayag (VPP), a non-governmental organization, established in 1913 at Allahabad has played a pioneering role in popularization of science in Hindi (VPP, 2012; Sinha, Mahanti and Kapoor, 2011). The Parishad started a popular science magazine named *Vigyan* (Science) in Hindi in 1915 and it is being continuously published since then. It has published a large number of popular science books. It has organized public lectures and seminars on scientific subjects. Many of the well-known science communicators in Hindi were initiated in the field by the Parishad.

Three national science academies established before India's independence played an important role in popularizing science. These were; the National Academy of Sciences India, at Allahabad (1930), the Indian Academy of Sciences at Bangaluru (1934) and the Indian Academy of Sciences (1935), first established at Kolkata and later shifted to New Delhi. On the occasion of laying the foundation stone of the National Institute of Science of India (later

renamed as Indian National Science Academy) in New Delhi on April 19, 1948 Jawaharlal Nehru said that, 'the scientific method is the only right method of approach to life's problems; and in India today it is even more important than elsewhere, as India is backward in science... Indians should pursue science in the right way and try their utmost to foster it. There is no other way except the way of science does bring development to human life and institutions. This is the scientific approach to life's problems... The fundamental thing is scientific approach. Man cannot change legally. But by creating an atmosphere where his actions are governed by a scientific approach, science remains the only right method of approach' (as cited in Jain, Ahuja and Mahanti, 1989: 6). Nehru further said that he was glad that the scope of the Institute of Sciences is comprehensive. He was hopeful at the same time that it will not presume too much and become too exclusive and disdain people who do not belong to it' (ibid). From Nehru's remarks it becomes obvious that he wanted the Academy to work for creating an atmosphere where due importance is given to scientific approach.

There were many other scientific societies for example Indian Mathematical Society (1907), Institution of Engineers (1920), Indian Botanical Society (1921), Indian Chemical Society (1924), Indian Medical Association (1928), Indian Physical Society (1935), Entomological Society of India (1938) and Indian Anthropological Society (1941). There are many others. All these scientific societies contributed towards popularization of science.

### Science popularization in post-independence India

Pt. Jawaharlal Nehru, the first Prime Minister of independent India, laid real emphasis on the development of science in India for societal development and also on spreading the spirit of science or scientific temper, as he called it, in the country. He explained the term scientific temper in his much acclaimed book *The Discovery of India* published in 1946. Nehru (Nehru, 1981: 514) wrote 'It is the scientific approach, the adventurous and yet critical temper of science, the search for truth and new knowledge, the refusal to accept anything without testing and trial, the capacity to change previous conclusions in the face of new evidence, the reliance on observed facts and not on pre-conceived traditions, the hard discipline of the mind etc — all this is necessary, not merely for the application of science but for life itself and the solution of its mundane problems.'

Nehru was hopeful that India would catch up with the developed countries in creating the real temper of science. In this context he wrote further that, 'science has dominated the western world and everyone here pays tribute to it, and yet the west is far from having developed the real temper of science. It has still to bring the spirit and the flesh into creative harmony. India in many obvious ways has a greater distance to travel in this direction. And yet there may be a few major obstructions in its way, for the essential basis of Indian thought for the past ages, though not its later manifestations, fits in with the scientific temper and approach' (Nehru, 1981: 514–515).

The strong commitment to science of the Government of India headed by Pandit Jawaharlal Nehru got expressed in the form of (SPR) Scientific Policy Resolution No.131/CF/57 adopted by the Indian Parliament on March 04, 1958. It stated, 'it is only through the scientific approach and method of science and the use of scientific knowledge that amenities (both material and cultural) and services can be provided to every member of the community'. The SPR asserted the government's commitment 'to foster, promote, and sustain, by all possible means, the cultivation of science and scientific research in all its aspects — pure, applied, and educational' (Government of India, 1958).



In 1976, the Government of India incorporated the development of scientific temper as one of the Fundamental Duties of every citizen through an amendment to the Constitution of India: 'to develop the scientific temper, humanism and the spirit of inquiry and reform' (Fundamental Duties of every Indian citizen vide Part IV-A, Article 51-A (h) — introduced as a part of 42<sup>nd</sup> Amendment to the Constitution of India in 1976).

The Sixth Five Year Plan document approved by the National Development Council stressed the need of science popularization for inculcating scientific temper amongst people. In fact the Report prepared by the Working Group on Science and Technology of the Planning Commission for the Sixth Five Year Plan had noted, 'the task of creating scientific temper is almost a necessity, as repeatedly stressed by Jawaharlal Nehru. It is important not only for the society but also for the very growth of science itself and its utilization in the development process.' It further stated that, 'it is time to give the idea of disseminating scientific temper an institutional mechanism with an appropriate design and framework. It may be necessary to consider the establishment of a National Council for Propagation of Scientific Temper; this should be examined further.' Accordingly the National Council for Science and Technology Communication (NCSTC) was established in 1982 by the Government of India as its nodal agency for conceptualizing, implementing and co-ordinating large-scale science popularization activities at the national level. Soon after its establishment the Council took up the task of creating much needed infrastructure for initiating science popularization activities in all the States and Union Territories of the country. In 1989, the Government of India established Vigyan Prasar as an autonomous organization for furthering the activities of the NCSTC. These organized efforts undertaken by the NCSTC, Vigyan Prasar and government organizations like the Council of Scientific and Industrial Research (CSIR) and the National Council of Science Museum led to the development of high-quality communication materials for disseminating science at popular level in the form of books, magazines including e-magazines, posters/charts, activity kits & demonstration experiments, audio-video programmes, street plays, dramas, puppetry, hands-on activities, origami, scientific toys, websites etc. National campaigns were organized. Efforts were made to train science communicators. These national campaigns have led to networking of different organizations including non-governmental organizations engaged in science popularization (Mahanti, 2010: 73–102 & Mahanti, 2011: 113–132).

The Science and Technology Policy of 2003 of the Government of India clearly highlighted the need to spread scientific awareness in the country. It stated, 'to ensure that the message of science reaches every citizen of India, man and woman, young and old, advance scientific temper among them, emerge as a progressive and enlightened society, and make it possible for all our people to participate fully in the development of science and technology and its application for human welfare. Indeed, science and technology will be fully integrated with all spheres of national activity' (Govt. of India, 2003).

In 1948 S. N. Bose entirely on his own initiative had established an organization with the following specific objectives; (i) to create a scientific awareness in the society, (ii) to foster scientific attitude among people and (iii) to make available information regarding recent developments in science (Chatterjee and Chatterjee, 1976: 73–74). The organization was named Bangiya Bigyan Parishad (Science Association of Bengal). A popular science magazine called *Gyan O Bigyan* (Knowledge and Science) had also started. Bose advocated strongly for the use of the mother tongue (in his case Bengali) in teaching and spreading science. Even in those days Bose went to the extent of proposing teaching of science in schools, colleges and universities in Bengali. Bose himself gave lectures in his MSc classes in Bengali.

The circular printed on the occasion of the inauguration of the Parishad noted that, 'despite the need of science at every step, the Indian system of education does not prepare Indians for it. ... The main obstacle so far had been the foreignness of the language through which education was being imparted. Today the tides have reversed. New hopes and aspirations are emerging. Now it is the duty and the responsibility of Indian scientists to popularize science through the vernacular medium and thus help create a healthy scientific attitude among the people. As a first step toward this effort it has been resolved to form a 'Bangiya Bigyan Parishad'. It happened mainly through the inspired leadership of Professor Satyendra Nath Bose' (Chatterjee and Chatterjee, 1976: 73–74).

Vikram A. Sarabhai, founder of India's space programme established a community science centre now known as Vikram A. Sarabhai Community Science Centre to improve the state of science education in the country and to make students well informed in science (Joshi, 1992). This institute has played an important role in institutionalizing science popularization activities in the state of Gujarat.

Another major science popularizing organization in India is the Marathi Vidyan Parishad (MVP) which was established in 1966. It was the offshoot of efforts of a number of scientists and engineers in Maharashtra who wanted to take science to the public, as they were worried that scientific information was inaccessible to the majority of the Marathi speaking people. After a decade of success in translating scientific books and articles into the local language and making them available to vernacular schools and citizens, MVP's efforts were to foment a scientific inquiry attitude among the population aiming at self-empowerment and social change (Pattnaik and Sahoo, 2011: 205–228).

A group of socially conscious science writers led by M. N. Gogte came together in the mid-60s to form a science popularizing organization. They felt that it was necessary to attempt to fill the lacuna that exists in the publication of Marathi literature for the masses. Being committed to the society and public on the one hand, and the development of the approach, on the other, this group of intellectuals were also acutely conscious of the fact that science today is locked in an 'ivory tower'. It cannot remain there if it is to develop into something worthwhile and meaningful for the larger sections of the society. Gogte argued that though in post-colonial India English language is widely used for business and higher education, English alone will not suffice. A large chunk of population does not know English either. Furthermore, he finds that since the language is foreign, the subject is steeped in esoteric jargon. He pointed out that local language is very effective to convey knowledge, invoke creativity, connect individuals, enrich culture and induce social reforms (Pattnaik & Sahoo, 2011).

As an organization, MVP was formed in 1966 and a constitution formulated specifying that the organization aims to: (i) popularize science through local language (i. e. Marathi) and enrich Marathi language for expressing science, (ii) explicate and enhance importance of science in human life and (iii) use science as a means of social criticism. However, the activities of the MVP have grown much beyond the scope of the objectives set. The initial actors of MVP unanimously felt that propagation of science does not require any ideological platform. Rather they argued for a common platform from which scientific knowledge aimed at bringing about rational thinking and attitudes (Pattnaik, and Sahoo, 2011).

MVP started initially with a group of 6–7 which consisted primarily of scientists and engineers. Today the membership has grown to over 1,500 and in addition to this; there are many non-members who participate in the activities which have been extended mainly through the establishment of personal contacts. It was observed that the individual life memberships of MVP have constantly increased in the last four decades. The number of individual life

members was 66 during 1966–1967 which arose to 1222 in 2007–2008. Though the institutional life members of MVP have increased, but in small number. During 1966–1971, MVP had branches. So, all the members of MVP branches were members of the main body. In 1972, MVP provided autonomy to branches and started calling them as local chapters. When these were branches, their income and expenses were also part of main body. However, once they became autonomous, they were free to have own incomes and expenditures. By doing so, MVP stopped including the branch members in the main body, hence the decline in number.

Most of the individual members of MVP are urban professionals, working at different scientific establishments of India such as Bhabha Atomic Research Centre (BARC), Council of Scientific and Industrial Research (CSIR), Department of Science and Technology (DST), Department of Atomic Energy (DAE), Inter-University Centre for Astronomy and Astrophysics (IUCAA), Tata Institute of Fundamental Research (TIFR) etc. The individual members of MVP range from scientists, engineers to teachers and academicians. It appears that MVP shares an affinity with the Maharashtra Government, as its members served in different capacities at various scientific and technological establishments. Among them, a group of elite scientific professionals like, B. M. Udgaonkar, J. V. Naralikar, Prabhakar Deodhar, Raja Ramanna and Vasant Gowarikar, were involved in the activities of MVP. They believed that their duties as scientists were not confined to their laboratories only but are spread also to science communications. They consider that Indian scientists should communicate their work to a wider audience to make them understand the value of their work. Even scientists have a lot to say about problems in Indian society, and they think that MVP provides a platform to communicate their views and opinions (Pattnaik and Sahoo, 2011).

Now, MVP operates through its 38 local chapters at the district and state levels. Of the 38 local chapters of MVP, 35 are working at the district levels and 3 are working at the state levels in Goa, Gujarat and Karnataka as these states have a significant number of Marathi-speaking population. The organizational activities are conducted through Marathi language.

In post-independent India a group of non-government organizations (NGOs) have played a very important role in popularizing science. Some of the important NGOs engaged in science popularization are: Kerala Sastra Sahitya Parishad (KSSP), Kerala; Srujanika at Bhubaneswar, Orissa; Pashimbanga Bigyan Manch, Kolkata in West Bengal; Science Centre, Gwalior, Madhya Pradesh; Eklavya, Bhopal, Madhya Pradesh; NCSTC Network, New Delhi; Assam Science Society, Guwahati; Marathi Vidyan Parishad, Mumbai; Tamilnadu Science Forum, Chennai; Pondicherry Science Forum, Puducherry; Haryana Vigyan Manch, Rohtak, Haryana; Tripura Science Teachers' Forum, Agartala; Madhya Pradesh Vigyan Sabha, Bhopal; Vikram A. Sarabhai Community Science Centre, Ahmedabad; and Jan Vigyan Vedika, Andhra Pradesh. These organizations are carrying out science popularization activities on continuous basis in the respective states. The States Councils of Science and Technology established in almost all the states are also supporting science popularization activities in the states. Today a large number of individual science communicators are engaged in creating scientific awareness in the country. Science coverage in print and electronic media has substantially increased.

People's Science Movement (PSM) has emerged as an important dimension in the field of science popularization. The origin of PSM could be traced to the experiments and experiences of Kerala Sastra Sahitya Parishad (KSSP). It catalyzed the networking of many NGOs in the country which resulted in the formation of the All India People's Science Network (AIPSN). The first All India People's Science Congress was held in Cannanore in 1988. The main issues addressed by PSM are environment, health, development, education and self-reliance. PSMs have on many occasions have triggered mass mobilization for

questioning social development issues. It would not be completely wrong that the science popularization movement of India with its rationalistic overtone has gradually transformed itself into PSMs. It is a metamorphosis that too decades to take place.

## Conclusion

Today in India a large number of science popularization activities are being carried out by government and non-government organizations. The major objectives of science popularization movements as perceived by the organizations and individual science communicators can be summarized as follows:

1. Making people aware of the recent developments in science and technology.
2. Enhancing the appreciation of the significance of science in their daily life.
3. Enabling people to take well informed and rational decisions as well as strengthen their decision making abilities.
4. Developing scientific temper in the society.
5. Making young people interested in science.
6. Enhancing the level of public understanding of science.

India is a vast and diverse country. It is necessary not only to improve and expand the activities of the existing organizations engaged in science popularization but also to establish new organizations. Mere incremental increase of the current level of science popularization efforts will not achieve the desired goals, the task of science popularization needs to be taken up on a mission mode. It should become an all pervasive movement. But the major challenges in the field of science popularization are creation of good resource material in local languages and networking of the organizations and individuals in the field.

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