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Understanding People's Science Movement in India: From the Vantage of Social Movement Perspective

It hardly needs emphasis that People's Science Movements (PSMs) in India have been very unique and such movements are not witnessed yet elsewhere although science popularization / science communication movements were witnessed in USA, Europe and Australia. As a study of unique social phenomenon catching up our academic fascination, the paper first tried to characterize the phenomenon of PSM; second, tried to locate such a phenomenon in its socio-historical contexts. Lastly, the phenomenon is empirically studied through the analysis of five extensive case studies of various types of People's Science Movement Organizations (PSMOs) from the view point of social movement perspective, i. e. Resource mobilization theory.

Keywords: People's science movements, Resource mobilizations, Civil society, Intellectual resources, Financial resources, Organizational resources, External Linkages, Ideology.

Introduction

Sociologically speaking the movement is a collective effort in a particular direction to bring change of desired type. Hence, a movement is what *moves* people toward their desired goals. PSM is people moving to achieve their objectives through science (Varma, 2001: 4796–4802). PSM seeks to bring social changes with the help of science. All People's science movements are some kind of social movements. A social movement is one form of collective behaviour in which large number of people are organized to support or bring about or resist change. Thus social movement can be seen as a collective mobilization, seeking change of structure, either through institutional or non-institutional means. The culmination of such movements is often the results of the rise and growth of interest groups, pressure groups, and influencing bodies, opportunity structures etc.

PSMs are a little studied phenomenon in India although these have been in existence for several decades now. But these are seen as wider currents of a social movements. Rooted in social reformists' thinking of the 1950s, PSMs attempt to popularize non-mystical, scientific thinking, especially among India's common masses. Many PSMs have evolved into signifi-

cant centers of activism. There is variety in the shades of PSMs. These shades can be combined under three trends: (1) humanitarian — a matter of personal conscience, without any social rationalization; (2) nationalist — an urge to contribute to the development of the national personality, coupled with realization which requires development of the economic conditions and the creativity of the broad masses of the people with whom, science and technology (S&T) must link directly; and (3) radical — an urge to contribute to the liberation of masses from social oppression as well as exploitation and through this to the release of a creative mass energy, a task mobilization which needs intellectual input and a scientization of mass culture. A mixture of these three trends generates a variety of people's science initiatives:

(a) Frontier challenges: going to the people and enquiring what their material needs are, and applying scientific and technological knowledge to meet them at costs within the means of a greater number of people;

(b) Knowledge transfer: mass education in S&T;

(c) Stimulating mass creativity: working together with the masses to devise 'appropriate technology', in the process stimulating technological creativity of the masses;

(d) Technology as a tool in political struggle: devising technology to serve as a tool in the political struggle of the exploited masses against their exploiters, more 'self-reliant' technology from the point of view of the poor, through which they may have greater control over the production of process;

(e) Conscientization: seeking to raise the capacity of the poor to analyze their environment scientifically and bringing to them scientific knowledge of wider reality to help them take appropriate courses of action for social change in their favour (Rahman, 1970).

The first three varieties are consistent with the first two trends, i. e. humanitarian and nationalist. The third of these may not be inconsistent with the radical trend and may be seen to overlap with the fourth. The fourth and fifth are explicitly radical. However, the 'conscientization' in improperly motivated hands can be reactionary or reformist aimed at preserving or marginally improving, the societal status quo.

PSMs have been widespread in India at the regional and national level since 1960s. They make an important group among Indian science movements. Indian science movements denote to all the science movements (e. g. anti science movement etc) which have emerged in response to modern S&T. However, it can be seen that the idea of PSM is evolved historically under the initiative of certain voluntary science groups. Many of these groups have multi pronged activities in areas including education, development, environment, health, science popularization, appropriate technology etc. The present study uses the term PSM in this strict sense.

PSM's critical role has been felt/recognized through the symbolic value of science. By accepting the symbolic value of science as its major political value, PSM demands for the dissemination of the scientific temper among the masses as a pre-condition for social transformation. On the other hand, these also demand for the use of scientific information and procedures in the method of decision-making and implementation of decision by the ruling elite. They even objectively probe the social and political dimensions of scientific temper that scientists provide when they underplay the hazards of nuclear technology or the use of DDT. Therefore, whether it is in the area of science education, spreading reasons and scientific temper in society, or the critical role of science in the developmental process for creating an equal and socially just society, the changed nature of relationship of science and society can no longer be ignored. Studying PSMs would examine these issues with visions and perspectives.

Locating the PSM in a Socio-historical Context

Among various people's movements, PSM is a growing and unique movement in India. It is unique to India since it is difficult to find a similar movement in other parts of the world. Parayil (1992) calls the PSM as a 'unique social movement'. He finds that it is probably the only citizen's movement of its kind, and perhaps in the whole World. PSMs have been initiated in specific contexts, by middle class intelligentsia. Guha (1988) notes:

"For PSMs, science has been distorted by the capitalist imperialist system and the task is to free it from these chains of domination and allow it to realize its true potential. In this sense, the PSMs are attempting to bring to fruition the ideals of the French Revolution — democracy, equality, and fraternity — that were taken out but never fully realized by the classical socialist tradition. PSMs believe that modern science and industrialization are not antithetical to each other's vision— rather, once freed from the imperatives of capitalism and militarism; science can be a major instrument in the creation of a just, egalitarian and economically prosperous society".

For PSM organizations, the human society is divided into two broad sections such as majority (have-nots) which is being continuously impoverished or facing the threat of being impoverished and a minority (haves) which is continuously getting enriched at the expense of the majority. S&T have been and still are a powerful weapon in the hands of this minority in their exploitation of the majority as well as the plunder of natural resources. And PSMs are partisans towards the majority whenever their genuine interests clash with the interests of the dominant minority.

Matthew Zachariah (1989), one of the protagonists of PSM, stresses that, economically poor and politically powerless people constitute the vast majority in most of the nations of Asia, Africa, and Latin America. Although the governments of these nations are or appear to be committed to development, their policies and actions to promote development mainly by stimulating growth in certain sectors of the economy do not necessarily improve the living standards of most poor people and indeed, create large groups of victims of development. The attempts of various Western governments, institutional agencies, national governments and non-governmental organizations (NGOs) to promote development in Asia, Africa, and Latin America during post-World War II and their acknowledged failure to do so in large measure have resulted in vigorous criticisms of their motives, approaches and actions taken.

The most persistent and valid criticisms of the attempt by most Western as well as national governments to promote development is that it ignores, except in rhetorical statements, the genuine aspirations of poor and powerless people. Three other major criticisms too follow. The national and international elites use the state to put in place where policies promote their own class interests prompting the legitimate question, i. e. development for whom? These elites do not understand the real problems people face and the contextual rationality that motivates such people to think and act in the ways they do. The elites do not value the knowledge and experience of the people on whom they impose their policies for development. This has been known as the 'top-down' approach.

The phrase 'development from below' acknowledges the validity of these criticisms and argues for a perspective focusing on the, (a) importance of confrontation and conflict in any genuine development process and (b) the necessity to make genuine, deliberate attempts to improve the living standards of poor people, attempts that cannot be too hasty or too slow.

The dominant class of the society commonly referred to as elites control and manipulate all affairs of the state. They control scientific and technological knowledge hubs, i. e. the university and research institutions, which do not have any form of social commitment. They also control all developmental superstructures. This has pushed the citizens of the state into background and ultimately into oblivion.

Of late a class of intelligentsia is emerging in the society which appears to have a deep concern about growing alienation between a minority dominant class, i. e. elites with access to knowledge, resource, power and privileges, and the majority common masses that are without access to those. Such deprivations resulted into the form of 'people's organizations' in the country. There has also taken place a remarkable spurt in consciousness of common people which largely remain unnoticed and unserved by institutional structures of society. For example, when state's corporate policies destabilized the environmental balance by polluting air, water, and soil deforestation triggered the emergence of people's movements in various parts of the country.

While the servility of the elite to western paradigm of progress and modernization gave rise to academic colonialism which produced a university system and a R&D set up that are turning out a class of scientists and professionals without social commitment, many people's organizations are coming up with commitments to disseminate scientific knowledge among the masses. Many of the PSM organizations are of this kind. It is not merely intellectual critical content but initiatives from 'intellectuals' that distinguishes PSMs from other movements. Throughout Indian history these intellectuals originated and existed away from the common people. Such intellectuals have, by and large, confined to the writings in alien language which could not empower the masses with their ideas. Post 1960s brought some intellectuals who emerged from the growth of people's movements in rural areas. These intellectuals who are equipped with the direct experiences of various problems and expressions existing in the society started contributing to spread and strengthen the PSMs in different parts of the country.

PSMs organizations present opportunities to intellectuals for interacting with people. Intellectuals also learn from the life experiences of the people. They have vast unstructured experiences. They are not capable of viewing their experiences in a structured whole and consequently unable to understand the complexity of the problems in larger social context. The intermingling and interaction of intellectuals and the common people brings an enrichment of knowledge. From intellectuals' side, this leads to the democratization of knowledge which in turn helps not only in reducing the prevailing social and economic inequality in the society, but also in achieving a better quality of life.

PSMs consist of a large number of actors including science professionals, engineers, doctors, scientists and a large number of teachers, local people and communities, and in many instances the *panchayats* (elected local governing bodies of India), across the country. The movement combines struggle and reconstruction efforts in areas of education, literacy, environment, health, rural production, energy and local governance systems and uses various forms of struggles to resist the neoliberal policies. Whenever feasible, it collaborates with the government, but also confronts it when it finds itself in disagreement. In particular, it has experimented actively in local level people's planning methods, in collaboration with the *panchayats*, as a means of resisting the centralizing tendencies of the neoliberal paradigm (Raina, 2005: 1-32). The crux of the PSM seems to be in making scientific and technological thinking and knowledge available and relevant to the common people in terms of their everyday experience.

Genesis, Formation and Growth of People's Science Movement

The genesis of the concept of PSM in Indian context is a post-colonial phenomenon. The decisive intervention came from the *Kerala Shashtra Sahitya Parishad* (KSSP). It was formed in 1962 as a Forum of Science Writers. The Science Writers Association of India (SWAI) was another independent initiative. KSSP was confined to the language of Malayalam (a south Indian Language), while SWAI, mostly in Hindi and English. In 1966, half a dozen other organizations came into existence in Bombay (now Mumbai), initiated mainly by scientists from Bhabha Atomic Research Centre (BARC) and Tata Institute of Fundamental Research (TIFR). These organizations were also networked into a Federation of Indian Languages Science Association (FILSA) in the same year. It was founded by M. P. Parameswaran (popularly known as MP) and his associates.

As an individual, he was influenced by Soviet model for science popularization while pursuing his doctoral studies in Nuclear Engineering from the Moscow Power Institute in 1965. He saw then in Soviet Union, science being popularized in native languages. It was popularized in three areas such as Turkmenistan, Uzbekistan, and Kazakhstan. In the then Soviet Union, such idea motivated Indian scientists there to meet once a week and thought of popularising science in Indian languages. This underlying philosophy provided Parameswaran a proposal that knowledge should be available in people's language. He also realised that the then Soviet Union was an inspiration to the Indian intelligentsia, as it stood before them as the model of socialist system, in contrast with the capitalism in United States of America (USA), during cold war days. The then Soviet Union had an upper hand in S&T in comparison with USA. This raised hope among the intelligentsia all over the world to utilize modern S&T for the progress of the society.

Parameswaran with this experience from the then Soviet Union and FILSA came to provide the leadership to KSSP. It was the largest¹ among all the PSM organizations in India and had been the most active one during the late 1960s to early 1990s. It was formed by the merging of three groups of intelligentsia. The first strand was the *Shashtra Sahitya Samithy* (Science Literary Forum) formed in 1957 at Ottappalam, by a group of activists and science writers. The second strand was by a group of Malayalee science writers who were united in 1962 at Kozhikode. The third strand was the Malayalee scientists working in Bombay (BARC, TIFR etc) who had begun to actively consider the possibilities of producing science literature in Malayalam and hence had started the *Shashtra Sahitya Parishad* in January 1966. KSSP was formally inaugurated in 1967 at Thrichur Conference and in July 1968 it was registered as a PSM organization under the Charitable Societies Act.

It is witnessed that how the small local groups of science writers and people involved in activities for the diffusion of scientific knowledge in Kerala society. As a part of KSSP's activities, several publications were brought out in order to popularize science in agreement with its objectives of science for the development of Kerala society. In the 1970s and 80s, the KSSP as an organization expanded into a mass movement² which devoted itself to other

¹ According to AIPSN member organization profile (2002, May), KSSP had 45,051 members. *Paschim Banga Vigyan Mancha* of West Bengal, the second largest PSM has a membership of 25,000; 16,000 in Tamil Nadu Science Forum of Tamil Nadu State, *Jan Vigyan Vedika* of Andhra Pradesh State consists of 12,000 members; 5,000 in *Karnataka Rajya Vigyan Parishad* of Karnataka State (Isaac et al., 1997).

² KSSP achieved the status of mass movement, "the only of its kind and perhaps the whole of Asia" in mid 1970s itself (Krishnakumar, 1977; Krishna, 1997b).

concerns, such as elementary education, health, environment, literacy, energy, development and micro planning etc. In 1973, the KSSP adopted the theme 'science for Social Revolution' (Zachariah and Sooryamoorthy, 1994: 20–27, 109) and had taken up a specific issue for intensive mobilization. Till 1978, KSSP was locating all the dissemination of science activities under the very term 'science popularization' only. But the phrase 'people's science movement' was coined by K. P. Kannan, another activist of KSSP and introduced formally, for the first time, in 1978 at the Trivandrum Convention of people's science groups. A distinction can be drawn here between science popularization and people's science movement on the basis of their nature and the role these played in the Indian context. The former is apolitical by nature and the latter is strongly political. Further, although both the types of movements emphasize on the use of scientific method, the former is more concerned about the dissemination of the content and information/facts of science whereas the latter is more concerned about the method of science and use of science as a social-political critique.

The Trivandrum convention brought all the like minded voluntary groups³ including KSSP together under the banner of a PSM who were working in areas of the interface of science and society. Some voluntary groups were attempting to popularize the natural sciences; some were engaged in focusing attention on the irrational attitudes and policies towards such basic issues as health and sanitation; some were engaged in highlighting the adverse impact of development activities as a result of wrong application of S&T; particularly in the field of environment; a few were engaged in demonstrating innovative and interesting ways of teaching science; while quite a few were engaged in the application of local/indigenous S&T in development activities in the areas of health, non-formal education, appropriate technology, housing etc. The role and experiences of these voluntary groups in the broader socio-economic and political context of the country was discussed in the convention. The deliberations were around four general themes such as (i) formal and non-formal education, (ii) people's health movements, (iii) scientific research and technology, and (iv) the utilization of science for social revolution (Vaidyanathan et al., 1979: 57–58).

The study by Zachariah and Sooryamoorthy (1994) also highlights the Marxian foundation of the ideology of KSSP. Parayil's (1992) work points out that many of the early founders of KSSP were influenced by the writings of British scientist and historians of science like Bernal and Haldane. The KSSP's leadership recognized that the development of S&T does not take place in a vacuum but within a society. The KSSP brought back science to the everyday life of the common man who is its creator and rightful beneficiary. It inculcated a genuine scientific outlook among the masses of Kerala, believing that the only beginning of real progress and change in society is science. It believes that the progress of science is related to the development and changes of social systems. Changes in the forces of production, which occur due to the progress of S&T, leads to social change and vice versa. It argues that the social change from feudalism to capitalism removed the science from chains in Europe. The progress of science led to new inventions and knowledge production that in turn helped the ramification of capitalism. As part of these changes, science became people-oriented and the development of printing technology furthered the democratization of knowledge. Thus, the stranglehold of religion on knowledge became vulnerable and liberal thought got an upper hand in Europe. KSSP points out that all these changes in social relations led to the birth of modern science and scientific method was widely acknowledged as the prominent way of knowledge production. But this process

³The website of KSSP provides the list of PSMs, which are the members of AIPSN.

did not happen in India and China where the feudal system persisted. Hence, the KSSP adopted the slogan “Science for Social Revolution” in 1974. As a PSM, KSSP recognized its role and responsibility for the propagation of scientific temper and the scientific method in society to foster the social revolution which is to be made possible by political movements. The activities of the movement fall in the areas of education, environment, health and development etc using science as a weapon for social change.

A second All India Convention was organized during February 9–11, 1983, at Trivandrum, which focused on the need to define the term PSM from a national perspective. In the wake of formal and informal discussions and interactions of organizations in the convention, four areas such as health, education, environment, and use of art as a medium of communication were identified for future programme of actions as a basis for initiating a PSM in the country. This led to the recognition of two forces that the movement is opposed to. The first of these forces consist of godmen who oppress the poor socio-culturally by perpetuating supernatural and superstitious beliefs; the second force is that of capitalist development which is “impoverishing the majority while enriching the few” (Jaffrey et al., 1983: 372–376). In May 1985, the KSSP and the other science-based voluntary groups organized an all India *jatha* (procession) in memory of thousands who died at Bhopal disaster. The science-based mobilizations in the states like Karnataka, Maharashtra and Andhra Pradesh had joined with the KSSP in organizing this *jatha*. As the contacts among the various groups and organizations grew, the concept of a *Shastra Kala Jatha* (Science Art Procession) took shape. The KSSP had been organizing such *jathas* since 1980 with the involvement of local artists. The 1985 *jatha* was followed by similar programmes by other PSM organizations like, Tamil Nadu Science Forum (TNSF), the Pondichery Science Forum (PSF), and the *Gujarat Vigyan Sabha* (Gujarat Science Assembly).

Also as a people’s education movement KSSP formed more than 1500 science clubs in schools under its auspices. Everywhere they conducted classes on different topics related to science, technology and society. The KSSP volunteers conducted the classes in schools and libraries. Some of the topics included in the classes are: Halley’s Comet; the Solar System; the Evolution of Matter; Nature, Science and Society; People’s Health; Natural Resources of Kerala and the Protection of the Environment; Fuel Conservation Techniques and Appropriate Technology. The KSSP has conducted several thousands of classes so far. Summer science camps and science talent shows involved 600,000 school children annually. “Science through Folk Art” and “Science Processions” to sensitize and educate rural people about scientifically and socially important issues were other activities that KSSP promoted. The 1988 report of the KSSP shows that it has published 372 books and monographs in English and Malayalam on various topics in S&T. It publishes four widely read periodicals, three in Malayalam and one in English. The three are: *Shastragathi* (The Progress of Science) for the common masses; *Shastrakeralam* (Scientific Kerala) for the secondary school students and youth; *Eureka* for primary school students; and the periodical in English is called as *Science for Social Revolution*. According to KSSP, its publications for children intended to inculcate scientific temper among children by urging them to ask questions and search for answers. KSSP’s publications for common masses also aim at the propagation of scientific temper. In 1976, KSSP started a ‘school for Technicians and Artisans’ (START) to equip the artisans and technicians who lack formal education.

During 1988–1991, KSSP seriously involved in the mass literacy programme organized in Kerala. The literacy programme in Kerala had started from the experiment in 1988 at Ernakulam district under the auspices of the District Literacy Council. KSSP

actively participated in it and thus, in 1990, Ernakulam district was declared as completely literate. Kerala was declared as a totally literate state on 18th April, 1991. KSSP's contribution to the success of the programme is widely appreciated. KSSP believed that the promotion of literacy is the duty of PSMs as literacy is a prerequisite for propagating science so that it is more than mere learning of the script.

The KSSP had been an active promoter and collaborator of the social forestry programme of the state forest department from 1982 onwards. KSSP is extremely conscious of the degradation of the forests in Kerala and also about the growing shortage of timber and firewood. It had, however, serious differences of opinion about the very meaning of social forestry in the Kerala context, about species selected and about the method of implementation. The 1985–1986 Annual Report pointed out how a privately owned plantation obtained a false certificate from the State forest department certifying a cardamom plantation as a coffee plantation in order to fell trees. KSSP volunteers and others stopped the activity by publicising the deception and conducting *dharnas* (sit-ins and shouting protest slogans in the place where an alleged injustice had occurred). The Report goes on to oppose the social forestry project of the state government supported by the World Bank. KSSP also initiated its own survey. Partly on the basis of work done for the survey, KSSP published in English a 12-page critique of the government's social forestry strategy in July 1986. The document questioned the selection of trees species for the programme, especially eucalyptus and on the basis of its survey, argued for planting fruit-bearing trees that the people preferred. Using relevant statistics, it mocked the government's claims on the net return from its project as 'imaginary'.

The health related activities of the KSSP, confined mainly to organizing medical camps, had drastically shifted to the agitation against the unscientific practices in medical field as well as the campaigning for people's health. In 1982–1983, one unit published a village wall newspaper against the scourge of alcoholism. In 1983–1984, KSSP organized measles vaccination with 10,000 doses of vaccine donated by the Rotary Clubs of Kerala. It had organized several Oral Rehydration Training (ORT) camps in villages (Zachariah and Sooryamoorthy, 1994). The year 1986 was devoted to conducting classes on "People's Health". The health classes of KSSP emphasising nutrition, preventive medicine, gastrointestinal diseases, cleanliness, health habits of people and first aid etc were a regular feature of KSSP's active units. Another major undertaking of KSSP was the health survey of Kerala that succeeded in the collection and analysis of the data on the health habits and health problems of Keralites in connection with the socioeconomic conditions. As a result of the survey, the KSSP asked the government to change its present health care programmes to emphasize on a preventive health care system rather than a curative system.

In 1986–1987, KSSP produced a drug information packet (DIP) for doctors and it was the first attempt to reach medical doctors. It contained data on the harmful practices prevalent in the drug industry, banned drugs and drugs that should be banned, and essential low-cost drugs that are as effective as high-priced items. The basic philosophy behind the development of DIP was that the health care must be people-oriented and not profit-oriented. During this period, KSSP started opposing the unscientific national drug policy of Govt. of India and denounced the policy as 'anti-people'. KSSP demanded that the government should minimize the power of multinational drug companies, and the doctors associated with them, to dictate unnecessary drugs for rather simple, preventable, water-borne and other communicable diseases. They argued that the present medical education should have strong social science content too (social medicine).

The KSSP's intervention in the Silent Valley⁴ issue helped it to develop a new perspective on development and raised the questions such as development for whom? What is the cost of development? Who pays for it? The Silent Valley issue further raised many questions about development and environment conservation. The debates were around the need of more energy resources and the conservation of environment. It forced KSSP to take a position and it totally changed its ideological orientation. KSSP did not believe in the existent dominant development paradigm that accelerates economic disparity and environmental destruction. It felt that proper planning is indispensable for the development.

Later on Zachariah and Sooryamoorthy (ibid) assessed the achievements and dilemmas of KSSP as a development movement. They opine that the movement proposed the development vision of self-reliance and popular participation. The study shows its involvement and immense contribution in the Total Literacy Project (TLP) 1990–1991, as a qualitative transformation in its mission. For the first time, in its history, the study contended that KSSP's considerable energy was focused on mobilizing the community to achieve a positive goal instead of mostly expanding it on opposing the goals of the state and private corporations. Majority of the members of KSSP are from middle class and it hardly attracted enough poor people to its ranks. So the stagnating membership, decreasing enthusiasm among members, the passivity of good number of units and the lack of women's involvement were the serious problems the movement faced later. Certain achievements of Kerala's development such as the high rate literacy, well developed infrastructure as well as the participation of working and middle class people in KSSP due to its emphasis on people oriented development helped it to be successful.

Zachariah and Sooryamoorthy (1994: 20–27, 109) traced the various factors behind the formation of PSMs like KSSP. They mentioned that the social services provided by the enlightened rulers of the princely States of Travancore and Cochin, the social services of western missionaries, the early social reform movements in Kerala, the nationalist movement, the socialist and trade union movement emerged in mid-1930s in Kerala, the *Sahitya Pravarthaka Sahakarana* (The Literary Workers' Co-operative Society) founded in 1945 etc made significant contributions to the widespread respect for formal education among the people. The study suggests that the absence of an ideologically unified intellectual class in Kerala created space for the existence and interaction of many ideologies as well as the peaceful coexistence of many religions. Their study revealed that the migration of Keralites to other parts of the globe and their return to Kerala with money and ideas raised the living standards in Kerala. They contended that these salient features of Kerala society made possible the emergence and growth of a movement like KSSP. Zachariah's (1989) study also pointed out that ideology plays a significant role in the PSM. Ideologies like Marxism have a great influence on the movement like KSSP. According to him, during the National Emergency rule during 1975–1977, CPI (M) activists in large numbers joined,⁵ and hence it became an organization dominated by Marxist mode of thought. The study finds that KSSP asserts Marxism as the science of society. It further alleges that the embracing

⁴ Silent valley is a tropical rain forest with an intense biological diversity in Palakkadu district of northern Kerala, where the State government planned to start a hydro-electric power project in 1973 and the work towards it began in 1976. In 1977, KSSP took up the issue and started mass agitation for the abandonment of the project. As a result of the mass protest, the State government in 1983 gave up the dam project as Central government withdrew the sanction for the project.

⁵ Communist Parties play a substantial role in Kerala's politics.

of Marxism led to emphasize certain topics and ignore others, which affected the credibility of the movement in the long run.

It was these initiatives that enhanced the conceptualization of PSM. By the mid 1980s other organizations for the propagation of science had also emerged in different parts of the country. These voluntary organizations, through mutual interaction and sharing of ideas influenced each other and these interactions empowered and equipped them to be relevant in Indian context. KSSP continued its mobilization activities at grassroots level. Along with the KSSP, 26 other like-minded organizations came together during the same year on the eve of third anniversary of the Bhopal Gas Tragedy in October-November, 1987 to organize the *Bharat Jan Vigyan Jatha* (People's Science Caravan of India) which was sponsored by Department of Science and Technology (DST), Government of India (GOI). The *jatha* covered 500 centres in 14 states of India. Five *jathas*, of five cultural or *Kala* groups from five different regions of the country, gathered at Bhopal. Even a 2000 km procession converged at Bhopal from five different directions. The message was — science for peace, humanity, secularism and self-reliance. This was a massive attempt for the development of scientific communication to promote scientific awareness through a cultural caravan. It helped for the expansion of PSM into a network of people's science organizations across the country. The success of *Bharat Jan Vigyan Jatha* (BJVJ) was followed by the first All India People's Science Conference, which was held in Kannur in Kerala in 1988. At this conference, AIPSN, a loose coalition of people's science organizations across the country, was formed. This network is one of the leading actors of contemporary social movement sector formed by the PSMs.

Conventionally the headquarter of AIPSN resides in the Secretary's office because the organizational job is done by the Secretary of AIPSN. Currently, the AIPSN is a large federation of 40 PSM organizations from twenty states (except in Jammu and Kashmir, and a few North Eastern States) and with a total membership of over 300,000 spread throughout India. The AIPSN is a fairly extensive network. It is committed to the use of science to promote science for equitable and sustainable development. The network has a reach in 18,000 villages spread over 300 districts of the country. The organizations under this network vary from each other in terms of their size, specific and local level initiatives. These PSM organizations are not only specialized in their roles but they are also localised in some part of particular province/state. The network has brought together students, school and college teachers, scientists, professional experts, writers, workers, farmers, political activists and thinkers to a single platform. The network played the role of establishing a strong communication medium among the activists from various PSM organizations.

The basic philosophy of the PSM is to treat S&T as a means to achieve the goal of an equitable and sustainable society. The PSM organizations believe that the public needs to develop a critical understanding of S&T in order to be able to participate in the application of S&T, especially in the choice of technologies in different contexts. Given the widespread literacy, the efforts to propagate science awareness and create a scientific temper among the people should go hand-in-hand with efforts in mass literacy. In 1989, the KSSP undertook a massive literacy drive in the district of Ernakulam in collaboration with the district administration. The KSSP made use of its well-honed medium of *kala jatha* to reach out to the population. This proved to be a major success. The success led AIPSN to take up literacy as an empowerment programme in the campaign mode, for which it set up a separate organization called the *Bharat Gyan Vigyan Samiti* (Indian Organization for Learning and Science) with the primary responsibility of placing 'literacy' on the national agenda. Indeed, literacy campaigns later on formed an essential component of almost all the people's science organizations.

However, the PSM activities in India can be classified into four broad categories, like:

1. **Science Communication and Science Education:** The basis of PSM in several states has been science communication and science education. It has been the basis for the movement in several states. It involves science teachers, working scientists and the science-qualified middle-class and students. The activities include science publications, popular science lectures, street plays and school science activities. The publication of science books, periodicals, articles in the vernacular languages was the initial and central activity. Cultural forms of communication are extensively used in the *kala jathas*. One of the sustained activities of the *Haryana Vigyan Manch* (Haryana Science Forum) has been its campaign against superstitions and myths. For children, in particular, science popularization by the PSM organizations have been through children's science festivals, children's science projects, quiz contests, science tours and children's science books. An Annual Children's Science Congress is held every year by the AIPSN shortly before the Annual Indian Science Congress. Besides, innovative science teaching methods are also propagated by some of the PSM organizations. Many of the PSM organizations are the recipients of the National Awards for Excellence in Science Communication, e. g. Pondicherry Science Forum (PSF), Tamil Nadu Science Forum (TNSF), Haryana Science Forum, the *Karnataka Rajya Vigyan Parishad* (Karnataka State Science Association), the *Madhya Pradesh Vigyan Sabha* (Madhya Pradesh Science Assembly), *Srujanika in the state of Orissa* not in Italies, the Assam Science Society, the *Paschim Banga Vigyan Manch* (West Bengal Science Forum) and the KSSP (in Kerala).

2. **Policy Critiques especially in S&T:** The PSM organizations allow scientists and professionals not only to critically evaluate state policies on S&T and R&D but also to study their inadequacies and propose viable alternatives. The underlying idea is that a detailed critical understanding of developmental policies may enable people's organizations to intervene in scientific decision-making. Sustained interventions in the area of S&T policy and management are required if a people-oriented science-society linkage emerges. The PSM organizations have periodically intervened in this direction through the means of advocacy and campaigns. These articulated positions of the PSM organizations have played a significant role in national debates on public policy issues like nuclear disarmament, patent laws and intellectual property rights, health and drug policies, energy and environment policies, reforms in the telecommunication and power sectors, and other policies of decentralization like that on *Panchayati Raj*. The role of a PSM organization like, Delhi Science Forum, New Delhi is a burning example of this.

3. **Grassroots Level Development Interventions:** This has been a major component of the PSM's initiatives through mass campaigns and discussions. By developing pilot models in literacy, health, agriculture, credit cooperatives, watershed development, local level planning programmes, promotion of small enterprises and their networking, the PSM organizations have been able to intervene effectively in the decision-making process in several instances. These campaigns serve the purpose of people's resistance to bad policies and highlight their demand for appropriate alternatives. The best illustration of this kind could be the role of BGVS.

4. **Alternative Technology and Development:** The PSM organizations have engaged in developing and encouraging people-oriented alternative technologies that are less capital — intensive and empower a large number of people, workers, craftsmen and artisans. Some examples of such initiatives are: wireless in local loop for telecommunications, the computer and village information software, bio-mass as replacement for cement/concrete in civil constructions, windmills and bio-mass based energy systems, organic inputs to boost agricultural

productivity, improved small-scale mechanized looms, small-scale oil presses and other food processing units, and mechanized black smithy. Roughly, once in every two years, the PSM organizations come together at the All India People's Science Congress (AIPSC) to review their actions, interact with experts, and learn from their experiences and plan ahead.

Thus, the PSMs have come a long way from merely disseminating scientific information to involving the people in advocacy, discussions, and interventions in science-related policy and developmental issues. The movement has gone from strength to strength to become a vibrant mass movement with practically every Indian State having an active people's science organization. The efforts of the PSM are becoming more relevant in contemporary Indian society as the adverse impact of liberalization and globalization is felt increasingly by the common masses and the state is gradually abdicating its responsibilities in education, employment, health and social welfare.

In India, people's science (voluntary) organizations do refuse to identify themselves under the generic banner of non-governmental organization (NGO). To them, understanding the notion of NGO requires two definitions. First, the people's definition of NGO which has certain characteristics such as: (a) normally limited membership, (b) mostly paid activists, (c) for many of them it is a livelihood, (iv) they get funding, (v) with the funding they do developmental activities, (vi) knowingly/unknowingly they are the members of agents. Second, United Nations (UN) defines a NGO which is a legally constituted organization created by private persons or organizations with no control or participation or representation of any government e.g. trade unions, and non-profits. These PSMOs do not adopt either of the definitions to be considered as NGOs. Consequently the votaries of PSMs claim that a PSM organization is the contrary to an NGO as it does not engage itself in any contractual services to any third party (even not on non-profit basis). Of course like an NGO it may does advocacy.

Rather people's science organizations prefer to call themselves as "public trusts", "activists groups", "pressure policy agencies/groups", "professional research consultancy agencies", "membership and non-membership based organizations" etc. All these come under the broad category of voluntary organizations (VOs) and based upon the act of voluntarism. The term voluntary organization encompasses a wide range of agencies, i. e. societies, co-operatives, trusts, trade unions, forums of activism etc. The voluntary organization as it stands can be defined as an organization rooted in civil society domain; that is non-profit and voluntary in nature and need to be registered under an Act such as: a society registered under the Societies Registration Act 1860; a trust registered under the Indian Trusts Act 1882; a cooperative under the Co-operative Societies Act 1904; a trade union under the Trade Union Act of 1926; and a company under section 25 of the Companies Act 1956 in order to meet the judicial requirements. To avail foreign contribution, they need to register under Foreign Contribution Regulation Act 1976. The absence of a common and concrete definition of voluntary organizations has led scholars to use other synonymous terms such as Non-Profit Organizations (NPOs), Action Groups (AGs), and Voluntary Development Organizations (VDOs) interchangeably.

Ideologies, Worldview and Discourses

Ideology is a particular type of understanding reality and a movement can not keep itself alive unless it develops its ideological frame and identity. An ideology of a movement relies on sets of ideas that explain and justify its purpose and methods. Moreover, ideology

provides legitimacy to the action programmes of a movement. The ideological underpinnings help acquire the movement acceptability and recognition among like minded organizations and even people at large in a society. It also helps to generate involvement to the cause and becomes a rallying point to assemble people to consolidate the gains of collective mobilization.

The ideology of a people's movement is very similar to the ideologies of political parties in India (although people's movements usually have no objective to capture political power). Many actions of people's movements are similar to the actions of political parties. Yet, people's movements do not directly take part in the electoral process and generally avoid overt identification with political parties for several reasons even when there is considerable overlap in membership. However, people's movement can be purely non-political. These can be subtly political or covertly political and not overtly. People's movements wish to appeal to broader segments of the population than political parties typically do. They are not limited by their appeal only to one class, one caste, one religious group or one gender group. They do not wish to be tainted by association with the 'dirty tricks' every political party inevitably indulges in sooner or later (Zachariah and Sooryamoorthy, 1994). Too close an association with political party may compromise their ability to criticise it when the party comes to power. People's movements do collaborate or cooperate with other groups, including political parties, on specific issues, to increase their strength as pressure groups, to marshal mass support and so on. These employ different action methods to accomplish their specific goals such as group study sessions, propaganda (including publications and street theatres), legal actions and massive protests. These too tend to identify and then personify an adversary in order to focus their active energy. In their actions, these will have a clear sense of the limits and possibilities of their capacity to bring about change. But it must be noted with a caveat that people's movements may in the long run become a political party depending upon its scope and mass base.

People's movements act as pressure groups against the state to accomplish their goals. Such movements may be without any overt ideological affiliation but the role these play in the process of bringing change is greatly determined by their ideologies. Contextualizing Andre Beteille's (1980) notion of ideology here one finds that to criticize a movement for having no ideology is also to say that the movement has no clear vision of a better future and hence neither the will nor the ability to construct a better society. Based on their vision of a better society, people's movements raise radical questions about the current authoritative allocation of human and financial resources to maintain or change a society. One of the constant problems in relation to the PSM ideology is whether the leadership of the movement genuinely believes in the ideology which drives the members or whether it merely uses the ideology as a tool to control and manipulate those members. This ideology is, of course, in competition with other ideologies and this creates many tensions within the movement.

Although every movement evolves its own body of ideas and goals, it is frequently under the powerful influence of already established ideologies like Gandhism and Marxism. Both Gandhism and Marxism have influenced people's science movements in India at different times. Gandhism and Marxism are two distinct, mutually contending ideologies with distinct praxis in India. They have been responding to Indian reality in the different ways. Though they are evolved within, and as response to modernity, in different ways, apparently they do not differ on the epistemology of science. Marxism holds the progressive nature of science while Gandhism argues for the development of rural technologies and utilization of it. Gandhi opposed mechanization and industrialization since it displaces labour and

exploit poor rural folk. The overall philosophy of PSM in India broadly follows the works of Marxian scholars like J. D. Bernal, J. B. S. Haldane, Joseph Needham and Hogben. The philosophy of these groups sees modern science as a tool of socio-economic transformation. They held modern science as a progressive and liberating force when freed from capitalist interests. These scholars further shaped the understanding of the role of science in society. PSMs in India were based on Gandhian notion of *seva* (service) in its formative years. However, in its formative years, KSSP, a PSM organization in India, was also influenced by J. D. Bernal's writings particularly *The Social Function of Science* (1939) and *Science in History* (1954). With a definite left leaning, the PSMs in India have emerged as one that has tried to be inclusive of people from all shades, i. e. from centre to left, and its intellectual efforts, have tried to synthesize Marxist and Gandhian thoughts.

The scientists of Bombay unit of KSSP who had spent years in the erstwhile USSR for their higher studies had immense influence in this regard. The 1970s was marked by the development of this ideology around science-society relationship. It was Marxian class analysis of society as well as historical materialism that helped the movement to define the science-society relationship. PSM is a middle-class movement because a consciousness realized among the middle class people, particularly intellectuals, for the first time resulted in the initiatives by them. PSM also has been a progressive movement since its inception. Hence AIPSN has been claiming to be an alliance of progressive forces. AIPSN does not accept the ideology of *Sangh Parivar* (right-wing ideology) of India. Consequently, AIPSN rejects the PSM organizations having a definite right-wing ideological leaning or even a centrist ideological leaning. Broadly, the activists of the PSMs are affiliated with two left-ideology based political parties such as Communist Party of India-Marxist (CPI-M) and Communist Party of India Marxist-Leninist (CPI-ML). The former holds the liberal worldview and the latter holds the radical worldview towards the science-society relationship. However, both come under one platform to bring the hope of socialism. With the emergence of Communist Party in 1957 as a major political force that championed the cause of peasantry, the struggles were further consolidated and politicised and assumed a nation-wide character.

On the one hand, PSM links science with society and studies the impact of modern science on society and vice-versa. On the other hand, it envisions a better, egalitarian society and believes that modern science can be used as a tool for the revolution to transform the social system from capitalism to socialism. It believes that science has the inherent potential to change society. S&T are developed by sharing of the experiences of the community and is the result of the generalization of the experiences. Therefore, science is the common property of humanity.

PSM and Subaltern Discourse: The subaltern discourse has unfortunately remained neglected at least by the mainstream sociology in India as well as the PSM studies, particularly. In this study, we took cognizance of this discourse and entered into paradigmatic dialogue for the dissemination of modern S&T in India. There are two distinct discourses flowing in the investigation, documentation, and dissemination of S&T in the post-independent (1947 onwards) India (Jain, 2002: 4–20). One, the 'elite' discourse of S&T that focuses high profile R&D and visibility linked to big industry, adopting the Nehruvian model of development, is shown to have emerged as a dominant stream. Two, the 'subaltern' discourse of S&T which argues that the elite discourse has always overstated the roles elites have played in building Indian nationalism compared to the role played by common people. It acknowledges the contributions made by the people (masses) on their own, independently of the elite. The principal actors of the subaltern classes and groups are consisting of the labouring population and

the intermediate strata. This discourse seeks to restore a balance by highlighting the role of the politics of people as against elite politics played in Indian history. Thus, the 'elite' and 'people' are viewed as two binary domains to constitute a structural dichotomy. Of course the elite discourse of S&T is the dominant one with state support. But although socially powerful subaltern discourse is less visible, closer to ground realities and linked to village and cottage industries, although based on the Gandhian model of development, still remains dispersed and in the fringe of the state apparatus.

The term "subaltern" is adopted from writings on the history of colonialism in India by Ranajit Guha. Subaltern discourse treats people as an autonomous domain which neither originates from elite politics nor depends on them. Therefore, the mobilizations in the domain of elite and subaltern politics achieve vertical and horizontal alliances respectively. It is admitted that given the diversity of its social composition, the ideological element in the subaltern politics is not uniform in quality and density. Thus, such diversities lead to pursuit of sectional interests, economic diversions as well as sectarian splits which tend to undermine the horizontal alliances in this domain. Guha (1982) also clarifies that the two domains have not been sealed off from each other but often overlapped mainly because the elite discourse always tried to mobilize and integrate the subaltern discourse but primarily to fight for elite objectives. However, the subaltern masses managed to break away from the elite control and put their characteristic stamp on campaigns initiated by the elite group. The whole thrust of subaltern discourse is on reconstructing 'the other history', i. e. history of people's politics and movements and their attempts to make their own history.

Subaltern discourse in the S&T system in India consists of entities which are dispersed and connect S&T capabilities of smaller voluntary groups to undistributed and unorganized production units (Jain, 2002: 5). Entities in this discourse are embedded in culture that is sensitive to local community practices. According to subaltern discourse, the PSMs rooted in a concern for people are strong and widespread. However, by the very nature of the movement and dispersed local actions, those engaged in these movements have been concerned with establishing their accountability to the communities they work with; little time and efforts have gone into either interacting with fellow activists or with higher policy echelons. Guha (1998) finds that the discourse thus remained 'subaltern' and ignored much the same way as the colonialist and nationalist perspectives in the historiography of colonised countries had ignored the peasant revolts, popular insurgencies and complex processes in a variety of institutions and practices of evolving modernity.

Science Movements in Europe, USSR, Australia and United States

In Europe

The thirties generation of twentieth century working in the period of the Great depression and the clash of Fascism and Communism questioned the society but tended to take science as they found it. In 1930s, the increasing awareness of the social consequences of science, produced an enlargement and intensification of concerns for the same which led to the social responsibilities of science (Barber, 1953: 5, 154–155). This increased concern was more manifest among the scientists themselves; especially among the British scientists. They were facing discrimination as they were excluded from the high-level Government appointments. The politicians also did not show any interest in the social impacts of scientific research.

Therefore, it was the concern of British scientific community to raise their social status out of which shaped the Social Relations of Science (SRS) movement (Werskey, 1971: 67–83). The SRS movement of British scientists was active between 1932 to 1945. As an offshoot of this period, the Society for the Protection of Science and Learning (SPSL), London came into existence in 1933 (Zimmerman, 2006: 25–44). It became a key agency in the international effort to rescue refugee scholars. The SPSL also raised political awareness among British scientists, uniting many voices in the struggle against the Nazi assault on academic freedom. This assault produced one of the greatest challenges that confronted British science.

Paul Gary Werskey (1971) argued that the SRS movement was neither monolithic nor cohesive. Ideologically, there were two polemic groups within the movement; the Reformists and the Radicals. The former group accepted the social order as it was, but the latter believed that only a society transformed along socialist lines would be prepared to make the fullest and most humane use of scientists and their discoveries. The Reformists consisted of senior scientists some of whom were experienced political ‘insiders’. The nucleus of the Radical group that emerged in the United Kingdom included natural scientists like J. D. Bernal (1901–1971), Joseph Needham (1900–1995), J. B. S. Haldane (1892–1964) and others. These natural scientists called themselves ‘scientific humanists’ and actually attempted to find a systematic sociology of science. The presentation by Nikolai Bukharin, Boris Hessen and other Russian delegates at the Second International Congress for the History of Science in 1931 provided a dialectical approach to the development of S&T which was a formative event for the Radicals group (Gummett & Price, 1977: 121–143). This radical nucleus attracted other prominent scientists including P. M. S. Blackett (1897–1974) and C. H. Waddington (1905–1975) and by the coming of the war, it was disseminating its viewpoint through the conferences of the Association of Scientific Workers (ASW) and its journal *The Scientific Worker*, and *The Modern Quarterly*.

The Radicals were inspired by Marxism and argued for the alliance of scientific community with those political forces who were most committed to the advancement of science for the benefit of the whole society. They exemplified the Russian scientific community and contrasted it with the scientists in Nazi Germany. It is pointed out that in Soviet Russia, unlike Nazi Germany; there was a mix of favourable and unfavourable social conditions for science (Barber, 1953). Bernal, Haldane and others repeatedly emphasized the superiority of Soviet scientific organizations, the scientific ethos of Russia’s leaders, and the comparatively high status accorded scientists in Russian society. Above all, they stressed the way in which scientific resources were devoted to the solution of basic economic and social problems (Werskey, 1971). It offered an answer to accusations against the social uselessness or even harmfulness of science. This background made the Radicals aware of the importance of the organizational and institutional setting of scientific work.

The most important sociological result of the work of this group was Bernal’s classic, *The Social Function of Science* (1939) which epitomised the Radical’s standpoint. Bernal was the main protagonist among the Radicals. In *The Social Function of Science*, he studied the organization of scientific knowledge and its social force, and almost predicted the crucial role that science would play in post-war history. Furthermore, he argued that science was for everybody and it had a function in society. In his book, he appealed to science teachers to change science education, and to adopt a leadership role in the community when scientific issues arose. Bernal’s proposal for the restructuring of science assumed that science was a value-laden activity. If used in a planned way, he contended that, it could improve the life of the people. This work led to his involvement with the ASW. During the 1930s this association became very influential.

Later in *Science in History* (1944), Bernal traced the interrelations between science and society and how they progress, by influencing each other. Bernal was a leading force in a new movement for social responsibility in science. To popularize his ideas, he built up and associated himself with social organizations among which noteworthy were ASW, the Division for Social and International Relations of Science (DSIRS), Intellectual Liberty, the World Federation of Scientific Workers (WFSW) and the World Peace Council (WPC). He was a founding member of the WFSW and the WPC, of which he was chairman from 1958 to 1965.

Bernal was a Marxist and considered the Marxist philosophy of dialectical materialism to be the most suitable philosophy for science. For Bernal, dialectical materialism was the most powerful intellectual current of the time. It provided the basis, not only for a revolutionary social movement, but also for the enhancement of science. It was a philosophy derived from science that brought order and perspective to science and illuminated the onward path of science. He saw dialectical materialism as a science of the sciences, a way of integrating the sciences, a way of contextualizing science in deep socio-historical perspective. He witnessed Marxist philosophy of science as a means of overcoming overspecialization and achieving the unity of sciences. His association with the British Communist Party (BCP) lasted from his student days to 1933, which was also damaging his influence on the politics of science. He was extraordinarily impressed by the attention given to science by the Soviet government and consequently became a protagonist of the USSR in the period of the Cold War. Bernal was the embodiment of the socially responsible scientist, a fine product of the immediate after-years of the Russian Revolution, where the new Soviet Marxism captured Europe's intellectuals. In his life, he sought to show how atheist ethics and socialist morality could be combined in a liberating rational humanism. The dominant idea that inspired him was a belief in the possibility to achieve human perfection with reason. He believed that science should only be neutral ethically, but that scientists themselves should be committed ethically. This is applicable to the Radicals generally.

In contrast to the Marxian inspiration of the Radicals, the premises of the Reformists were broadly Saint-Simonian (Werskey, 1971). Moreover, the Reformists were pessimistic about the systematic social control on their profession. They pointed out the total integration of scientists into the political systems in both Nazi Germany and Stalinist Soviet Union and believed that the fervent nationalism which informed scientists' attitudes in the two countries was opposed to the values of an international scientific community. Richard Gregory, who edited the journal *Nature* from 1919 to 1938, acted both as coordinator and advocate for the Reformists group. He was constantly advocating the application of scientific expertise to the whole range of national economic, technological and administrative problems. Thus, the objective of the Radicals for a comprehensive central plan was contradictory to the decentralized functional control desired by the Reformists.

Before 1938, both Reformists and Radical groups were working through separate organizations. Reformists actively participated in the British Association for the Advancement of Science (better known as BA) and British Science Guild (BSG). On the other hand, the Radicals involved not only in the ASW and the Cambridge Scientists' Anti-War Group (CSAWG), but also in Labour and Communist parties. CSAWG was an initiative of Radicals at Cambridge, consisted of about eighty scientists and the graduate students at Cavendish Laboratory and the Biochemical Laboratory in 1933–1934 (Elzinga, 1988).

Paradoxically, in the midst of such intense political disagreements, both the factions came together in 1938 and formed the Division for the Social and International Relations of

Science (DSIRS) within the British Association in order to study the effects of the advances in science for the well-being of the community, and reciprocally, the effects of social conditions upon advancement in science. The idea for such a division originated in the Committee on Science and its Social Relations (CSSR) set up in 1937 by the International Council of Scientific Unions (ICSU). There it was decided on the logic that the kind of problems related to the social relations of science would best be handled by a division set apart from the parent body. In spite of all the ideological differences, they could work together until 1945. Most of the prominent members of SRS movement belonged to the London Dining Club, the Tots and Quots Club (Gummett and Price, 1977). These clubs were founded before the war and organized by Professor Solly Zuckerman, a sympathiser of J. D. Bernal's manifesto of 1939 for the planning of science. The Tots and Quots Club's own Penguin Special of 1940, *Scientists in War*, aimed towards the effective national utilization of science which was blocked by vested interests within the government and the scientific establishment. Both Radicals and Reformists joined their hands in the Tots and Quots club also. The shared concern of both the groups about the effective utilization of scientific expertise for the victory of Britain in the World War II was a unifying factor.

After the closure of the DSIRS, in 1950s many groups mushroomed, notable among them were WFSW, Science for Peace and the Campaign for Nuclear Disarmament were the prominent ones. The WFSW was formed in July 1946, and they started a journal, *Bulletin of the Atomic Scientists*, which was an important voice on science and politics (Elzinga, 1988: 87–113). The WFSW was broadly drawn from and consisting mostly of trade union type of affiliates. It was to provide a forum to promote the political responsibility of scientists, the international collaboration of associations of scientific workers, and to lobby for disarmament and the abolition of nuclear weapons. The scientists who were the members of WFSW tried to make clear the general public about the significance of hydrogen bomb. Their comments and warnings were widely published in the newspapers as authoritative statements by scientists in a special position to enlighten the public.

The WFSW acted as the conscience and the vehicle of social responsibility for the global scientific communities. As a result, it helped to bring about the first Pugwash meeting in 1957 (Cross & Price, 1988: 49–50, 152–159). The meeting facilitated for the emergence of the Pugwash movement. The movement got its name after its first meeting in the village called Pugwash in Canada. The movement was shaped in the wake of the declaration issued by eminent scientists like Albert Einstein (1879–1955), Bertrand Russell (1872–1970) and eight other scientists in July 1955 condemning the development of the hydrogen bomb. The objective of the movement was to foster friendship and understanding among international scientific communities in order to facilitate peace and disarmament. The Pugwash Conferences deliberated on all the aspects of the social relations of science and the social responsibilities of scientists. The Pugwash movement believed that peace is more than merely the absence of war. It encompasses issues of economics, the environment and human rights.

The British Society for Social Responsibility in Science (BSSRS) was a group established in 1969 to stimulate an awareness of the social significance of science. Members were primarily scientists and those active in academic politics. The BSSRS was concerned with the issues of; (i) scientist's individual and collective responsibilities, (ii) political, social and economic factors affecting S&T, (iii) drawing the attention of the public toward the implications and consequences of scientific development, for making an informed public. When the members of BSSRS became explicitly radical and transformative in their policies,

almost all of the scientists with established careers resigned and formed a new Council for Science and Society (CSS). For example, John Ziman, a professor of Physics, among others who resigned from BSSRS and was a founding member of the CSS. They saw their role as elite whose job was to oversee science that least it be abused. In an essay, 'The Impact of Social Responsibility of Science', Ziman writes:

"The BSSRS people, for example, have been telling the chemical and biological warfare (CBW) boys that they were all monsters because they were using scientific knowledge — 'which is for the good of mankind' — in an evil cause, i. e. war. Now there is no clause in the *Social Contract*, the *Talmud*, the *Koran*, or the *Analects* of Confucius stating that scientific knowledge is for the good of mankind or even that scientist must be a cosmopolitan pacifist & internationalists. To this, CBW gang have had every right to reply that they love their country, that they don't propose to see their sisters die horribly of enemy anthrax, and that they will go right on with their patriotic (if unpleasant) duty (1971)."

The problems of science, like those of the legal and medical professions, are best dealt with by self-policing professional bodies. If such bodies do their jobs well, the public will be in good hands. Advocates of this position are caught between the deep conservatism of orthodox scientific colleagues and radical critiques of science and expertise.

The SRS movement had impact as well as opposition. The opposition came in 1940, when a group of conservatives inspired chiefly by Michael Polanyi (1891–1976) and John Randal Baker (1900–1984), formed the Society for Freedom in Science. The Society for Freedom in Science (SFS) devoted to the defense of 'pure science' and the absence of any form of social control of science. But Bernal believed that all science was inextricably enmeshed in social forces. The Society was formed in specific opposition to the views of Bernal and his colleagues (Barber, 1953). Both Polanyi and Baker provided a liberal alternative to the radical position of Bernal. They were more inclined to Reformists, though occasionally attacked the Reformists. The Radicals were strongly criticised by the group, for their uncritical admiration of Soviet communism and Stalinist regime. John Baker was intimately connected with the SFS and wrote bitter attacks on the radical scientists. Baker, an Oxford Biologist wrote the 'Counterblast to Bernalism'. In this remarkable attack Baker refers to "gangs of scientists being told what to discover... Let the gangsters work always in gangs... Let there be freedom, nevertheless, for those who lack the gang instinct..." (Cross & Price, 1988). Bernal's reply was:

"It would be sheer waste of time and ink to attempt to continue a controversy on Dr. Baker's terms. But the issue itself is real enough, although it can not be seriously discussed till the caricature of it is cleared away. What science is for and how it can be best carried on, are vital questions to discuss and act on. The first question has really two distinct parts, according to whether we consider science as a social activity, part of the general complex of activities, or as the personal interests of an individual. No question arises as to whether or not science should be used for social ends. It is being used for social ends and largely for bad ends. Now what ultimate ends do we set for science *as it is the body of* the old indissoluble human trinity, goodness, truth and beauty (ibid)."

In his book *The Scientific life* (1942), Baker lists some of the aims of the SFS. The foremost among these was the preservation of academic freedom, central to Polanyi's attacks on the SRS movement. In the *Foundations of Academic Freedom* Polanyi (1947) states:

"Academic freedom can claim to be an efficient form of organization for discovery in all fields of systematic study controlled by a tradition of intellectual discipline. The unity between personal creative passion and willingness to submit to tradition and discipline is a necessary consequence of the spiritual reality of science (Cross & Price, 1989)."

Though the Society had a stake in the disintegration of the popular front launched by the rival groups, the major reason, according to Werskey (1971), was the gradual improvement in the Government's treatment of science and scientists. Polanyi was considered to be the chief architect of the Freedom in Science Movement. It is believed that his persistent advocacy for freedom opposed the emerging SRS movement and had a profound impact on the structure of post-war science. He went to extraordinary lengths to oppose the SRS movement and thus linked it firmly with Soviet style planning, Marxism and the horrors of dialectical materialism.

Social Relations of Science (SRS) Movement in Australia

The influence of SRS movement also extended to Australian science. The small scientific community in Australia was largely composed of Oxbridge graduates and a significant number had come under the direct influence of Bernal himself. Under the influence of Bernalism, the Australian Association of Scientific Workers (AASW) was formed in 1939 by Eric Ashby at the University of Sydney. Ashby and his associates founded the AASW modelled on the radical British movement inspired by figures like Gregory and Bernal (Fawns, 1985: 166–175). The aims of the Association included the development of science for Australia and promoting science for the welfare of people through planning. Other concerns were the development of science teaching and the status of women in science. The membership of the AASW included teachers as well as academics who were interested in the development of the social and biological sciences. With the publication of *Australian Journal of Science* from Sydney in 1939 the Association was able to signal their engagement in social planning particularly in public education about science. The social relation of science was a prominent theme for the *Australian Journal of Science* to organize a national voice for scientists.

Things began to change during the 1960s to 1970s. The liberator's face of science was lost from view. The radical social movements that emerged in the United States and Europe around late 1960s out of the anti-Vietnam, anti-imperialist, ecological, feminist and student protest movements were divided over the question of science (Beckwith, 1986). These movements epistemologically broke away with positivism and scientism (Elzinga, 1988: 87–113). The radical science movement, which arose in this period, not only changed the lives of many people working in science, it also altered the course of debate over public issues involving science e. g. occupational health hazards, academic agricultural research, weapons development, socio-biology, genetics, intelligence and race.

Radical Science Movement in the United States

Initially the radical science movements offered a mostly political critique of science which did not challenge the epistemology of science. But the New Radical Science Movement (NRSM) in USA, which emerged in 1968, brought the conspicuous ideological dissent with the old movement. In 1969, several events that contributed to the formation of new the radical science movement were: First, students at universities around the country on March 4 initiated a one-day research strike against the Vietnam War, protesting the use of science to develop technologies for the war. A group of academic physicists protested

such uses of science at the meeting of the American Physical Society (APS), and out of this meeting grew the organization of Scientists and Engineers for Social and Political Action (SESPA), later to become Science for the People. Members of SESPA were then invited to make a presentation at the 1969 meeting of the American Association for the Advancement of Science (AAAS) held at Boston. The AAAS meeting catalyzed the formation of a group in the Boston area which organized a number of events and sessions, including a panel discussion called as "The Sorry State of Science". Organized mainly by science graduates and postgraduate students, this forum launched a broadside attack on the ways in which science was being used. It dealt not only with specific problems such as weapon systems, but also with fundamental flaws in the relationships among science, government, industry, and the people (Beckwith, 1986).

Second, in Europe groups of scientific workers from Rome, Naples, and Paris were attempting to democratize certain research institutes by demanding collective decision-making about scientific projects, equalisation of pay, upgrading of the education of support workers, and changing of research priorities to meet the needs of poor and oppressed people. In 1970 the radical group in Naples occupied the International Laboratory of Genetics and Biophysics for several months in an effort to win these demands.

Third, developments internal to science in the 1950s and 1960s also played a role in the generation of a new radical science movement. In the post-Sputnik era there was a tremendous influx of young people into science, and the size of the scientific community mushroomed. The new young people with ample financial support for their research challenged the hegemony of older, established scientists. The balance of power in science was shifting away from the elite few to this new generation. This situation extended beyond strictly scientific matters to a challenge for the older and more elitist ways in which scientists had dealt with social controversies in science. For instance in Wisconsin, while university faculty members testified for the use of DDT in agriculture, graduate students presented the case for the banning of DDT.

Finally, a trend in the philosophy of science was also exerting its influence. Thomas Kuhn's *The Structure of Scientific Revolutions*, published in 1962, and the subsequent publications of *Against Method* in the year 1975 by Paul Feyerabend, were challenging the classical view of objective science. In other words, they raised awareness of the non-objective factors in science. These philosophers pointed out the psychological, social, and political forces that determined the very conception and practice of science.

In 1969 all these factors combined to generate the radical science movement. The largest and most prominent group was Science for the People (SftP) of the United States in 1970s. The SftP group was composed of professors, students, workers and other concerned citizens who sought to end potential oppression brought on by pseudosciences, or by the misuse of science. This movement quickly developed characteristics which sharply separated it from the scientific activism which has preceded it, notably an anti-elitist politics. While many of the new activists were younger academic scientists, others who played an important role were students, laboratory technicians, high school science teachers, industrial scientists, computer programmers, and nurses. In accordance with their New Left Wing politics, the issues with which these groups dealt expanded into realms not treated by the earlier movements. These new activities included, scientific aid to socialist countries; technical assistance to the poorer sectors of society, including workers threatened by automation or wanting to learn about occupational hazards, farmers confronting pesticide poisoning; radical groups such as the Black Panthers dealing with community

health problems; and the combating of scientific arguments used to justify the inferior social position of women and minorities. These programs were paralleled in the newly emerging radical health movement which included such groups as the Medical Committee for Human Rights and Health PAC (Beckwith, 1986).

The theme of the radical science movement was four-fold. First, the movement was to develop an overall critique of science. For example, it expanded its focus beyond military questions and saw each issue as a manifestation of the fundamental problem of control of science under capitalism. Second, the radical science movement extended the analysis of the non-objective factors in science. In other words, the subjects scientists chose to work on, the way they carried out their research, and the conclusions or products they developed were all heavily influenced by political and social factors. Out of this analysis, "Science is not Neutral" became one of the themes of the radical science movement. Third, the movement saw science as an ideology. Finally, the radical science movement attempted for a "people's science" which no longer would serve the rich; rather to benefit the needy.

The theme of the people's science is quite relevant in the present context and it has been carried on as the radical science movement. For example, The New World Agriculture Group (NWAG), an organization comprised of academic agricultural scientists and Science for the People, sent its members to help people in Nicaragua to fight plant pests while avoiding the destructive overuse of pesticides. Thematically, the movement focused on issues where S&T were having an impact on poor and working-class people. The exposure of workers to occupational health and safety hazards attracted the attention of the radical science and health movement. Consequently, Committees on Occupational Safety and Health (COSH) groups were set up to provide the information on industrial pollutions, and other hazards to workers (*ibid*).

A faculty statement issued at the Massachusetts Institute of Technology (MIT) in early 1969, resulted in the founding of the Union of Concerned Scientists (UCS). This document was originally signed by 50 senior faculty members, including the heads of the biology, chemistry, and physics departments, and was later circulated to the entire faculty for endorsement. Scientists formed the organization to initiate a critical and continuing examination of governmental policy in areas where S&T are of actual potential significance and devise means for turning research applications away from the present emphasis on military technology toward the solution of pressing environmental and social needs (Founding Document: 1968 MIT Faculty Statement).⁶ In other words, the statement called for greater emphasis on applying scientific research to pressing environmental and social needs rather than military programs. The UCS gradually widened its membership base. In 1992, the UCS's Conference on World Scientists' Warning to Humanity on the environment was signed by about half of the living Nobel laureates in the sciences, for a total of roughly 1,700 researchers (Sorensen, 2007: 374–375). Now the UCS is an NGO, multi-issue interest group with memberships as large as 250,000. Its membership is no more confined to MIT faculty and students alone; it is inclusive of faculty and students from all over US, concerned citizens and corporates etc. It interests now on cover issues like, Global warming, clean vehicles, clean energy, nuclear weapons and global security, food and agriculture etc.

Working to bridge a gap between scientists and the media, the Scientists' Institute for Public Information (SIPI) was established in 1963 in the United States to disseminate expert

⁶ The Founding Document: 1968 MIT Faculty Statement is available on the website (URL: <http://www.ucsusa.org>) of Union of Concerned Scientists: Citizens and Scientists for Environmental Solutions.

information on S&T to journalists through a variety of means.⁷ SIPI's best-known program was the Media Resource Service (MRS), which was founded in 1980. The MRS serves as a referral service for journalists seeking information from scientists, engineers, physicians, and policymakers. In addition to the MRS, SIPI operates the Videotape Referral Service (VRS), another free resource service which aids broadcast journalists in finding videotapes to accompany S&T related stories. The VRS also provides a list of videotapes for an annual SIPI conference called "TV News: The Cutting Edge", a meeting of scientists, television news directors, and science reporters. The activities of SIPI have focused on issues such as nuclear waste disposal, military technology and budget priorities, and human gene therapy.

Thus, the new radical science movements like SftP, UCS, and SIPI focused their attention on the abuses of science by the military-industrial complex, rather than on the biases in the content of science. Besides, the new movements provided an alternative organizational ideal — a democratic or participatory ideal — for the construction of knowledge.

The new movement also was not monolithic and at least three ideological stands were evident in it. A moderate position held by Jerome Ravetz among others criticized the old movement for its attempt to extend the scientific method to all spheres of life, for overlooking the multiple effects of S&T both beneficial and harmful, for their ecological insensitivity, and for the propagation of an idealistic picture of science. In the second group, the radical position was represented by Hillary Rose and Steven Rose. The science vs. use/abuse and science vs. ideology distinctions remains firm, in the books of Rose and Rose entitled, *Science and Society*, *The Political Economy of Science* and *The Radicalization of Science* which canvass Marxist views on science. They pointed out that the question of the abuse of science is deeply rooted in the contradictions within science itself and it is a non-neutral, ideology-laden activity. Instead of a science formed in the hierarchical, ruling class-dominated, sexist institutional arrangements, they anticipated a self-managed science which is a collective enterprise: a "science for people". The third group, the ultra leftists was represented by people like Robert M. Young and David Dickson. They proposed that science is not part of the economic base of the society, but that of the ideological superstructure, and denied the proposition of scientific knowledge as truth and technology as a tool. Dickson (1974) proposed for utopian or alternative approaches to S&T through his book *Alternative Technology and the Politics of Technical Change*. Robert M. Young popularly known as Bob Young (1977) argues that the entire scientific enterprise — theory included — is based on an ideology. To him, scientific enterprise does not reflect, therefore, in any sense just social relations.

This is how science movement is enrooted in the western societies. But the way in which it is received and systematised in other parts of the world, especially in non-western societies, still remains the primary concern of the present study. Before proceeding to our study of Indian PSMs, it is essential to have a cursory glance on the science popularization movement in the non-western, non-capitalist and non-democratic societies.

Science Popularization Movement in former Soviet Block:

In the early 19th century, imperial Russia experienced a reading and publishing revolution outside the purview of the state. With the hope of expanding the commoners' scientific horizons an enlightened publicist named Nikolai Novikov had built an entire enterprise

⁷ Scientists' Institute for Public Information (SIPI) from Environmental Encyclopedia. 2005–2006, Thomson Gale, a part of the Thomson Corporation, available at URL: <http://www.bookrags.com/research/scientists-institute-for-public-inf-enve-02/>.

around the publications of popular scientific tracts and text books. By the late 19th century, scientific societies, the academy of sciences, popular editors and pedagogues got involved in a vast movement to popularize science throughout the then Soviet Russia. This movement was very much about the content of popular science tracts as it was the method of popularizing this material to the larger audience of commoners. That apart, during the imperial period S&T had received the patronage of the Russia emperor Peter the Great.

As expected, in the aftermath of 1917 Bolshevik Revolution, the science popularizers found the support of the Marxist state as a partner in spreading science among the less educated masses. This was true at-least until 1928, as during this period the pre-revolutionary editorial boards, museums, scientific societies and even individual publicists were recalled and supported to become the part of the cultural revolution of the Communist Party.

The Bolsheviks therefore wanted to particularly use the pre-revolutionary scientific elite in their mass educational campaigns. But with the unleashing of Stalin's Industrial and Cultural Revolution from 1928 onward, the science popularization movement took a different turn again. The then communist state desired the science popularization movement to coalesce with communist party's utilitarian goals and needs, i. e. to revive the industrial sector of the Russian economy. This took the form of a new Stalinist technologically oriented popularization campaign that emphasized particularly the Soviet technology and its glorification. Thus the earlier enlightened imaginative public science that had aroused the 1917 divide got transformed after the 1928 into an applied S&T for the working class. This applied S&T of Stalin regime became the symbol of Soviet pride and glory vis-a-vis the capitalist waste. More emphatically after the World War II, with the successful detonation of nuclear bomb in the central Asian Steppe in 1949 and with the launching of Sputnik-1 in 1957, Soviet Politicians became increasingly aware of the competitive edge of Soviet technology and campaigned to politicise the Soviet scientific and technological feats keeping in mind both the domestic audience and capitalist west. In the event of launch of Sputnik-1, there was a celebration of technology in Soviet Russia then, a host of journals and newspapers (including military's Red star) published laudatory articles on Soviet Rocketry, Space flight and new Cosmonauts. Mass public spectacles and events commemorated new technologies of space age, and fitted into the paradigm of the ideological and technological race with the capitalist west during the cold war period (Andrews, 2009: 129–132). Not surprising that in the Soviet Block especially in the USSR and Poland, scientific and technological information/achievements served as an essential element of political propaganda. Since science in the Eastern Block had to show the superiority of the Real Socialist Political system over the capitalist system, science popularization was the main tool to demonstrate and prove it, may be in a vulgarized way.

When the Soviets represented the hardliners in science, the Polish represented a politically controlled liberalism in science. The post World War II science popularization in Poland is worth mentioning as it came under the so called ideological offensive in 1948. Administrative system of science popularization came into being on the model of USSR. One central institution was founded in 1950 named the Society of Universal Knowledge. But the science issues were managed conclusively by the central committee of the Polish Communist Party. The Polish Academy of Sciences, as the apex scientific body of Poland, was established in 1952 again on the model of USSR.

This was not only to determine the course of scientific research, but also to serve as the highest state office for all the Polish universities and advanced academic studies. Of course

a certain part of the Academy's concern was diffusion of science. The major concern of the Academy was of course overwhelming scrutiny and censorship in the academic and scholarly output and hence to decide the character of books in print, articles in press, and broadcasts. After 1956 this role of the Polish Academy declined greatly. No doubt that Poland was still much more liberal compared to others in the Eastern Block. Polish scholars were allowed to interact with the West, very few scholars/scientists were dismissed, forced to work as care takers, doormen, bus and tram drivers etc; as it happened in many countries in the Eastern Block. Those scholars not allowed to work with students were allowed to do research in the Polish Academy of Sciences. Even after 1956 they were allowed to publish books and articles. With permission some of them also could travel abroad. Slowly the political situation improved, some were allowed to get back to the campus and teach. Some non-government channels gave them the opportunity to publish too. Yet there were restrictions on the scientific conduct of the scientific community.

Nevertheless popularization of science did not decline in Poland in the post World War II period. As noted by Zasztowt (2009: 139), over half of the books produced in Poland during 1944 to 1951 were connected with science and its popularization. The best known scientific publishing houses, those officially supported the state were, The Reader, Universal Knowledge, The State Institute of Educational Editions, The Co-operatives of Books (of Communist Party) and the Cooperatives of Knowledge (of Socialist Party). A few private firms like Gobethner, Wolf, Trazska, Michalski, Evert etc were also publishing then but were independent.

But in 1949 all collapsed. Of course in 1953 the state liberalized the control. Good number of scientific journals re-appeared but only those ones which stressed the value of science dissemination and those advertized and propagated the materialistic point of view. In the mid-1960s although the Party's Central Committee declared that it had no intention of interfering in specific jobs or workshops for men of letters, the Socialist Realism was declared as the preferred mode of expression. In 1964 March 33 intellectuals from universities had written to the Polish Prime Minister protesting on the issue of 'limits in rationing papers' but were reprimanded. The Soviet influence persisted. However university professors/scientists got some limited amount of freedom. Most prominent among the scholars were allowed to have their own materialistic philosophy without repercussions. Link with western capitalism was renewed slowly through scientific writings. The efforts to create a new 'homo-Sovieticus' in Poland did not succeed. However the Soviet influence continued. Yuri Gagarin and the Soviet space explorations became great success stories and dominated science fiction literature in the Eastern Block too. This too linked the Eastern Block to the West. Stanislaw Lem, a Pole and author was a pioneer as his novels like, *The Astronauts*, *The Magellanic Cloud*, *The Star Diaries*, *The Invasion from Aldebaran etc* had broken the barriers from both the sides of Iron curtain. In the beginning of 1970s, Poland, under a new regime opened the door to the western capitalistic and democratic ideas that infiltrated into young minds. After 1968 there was an exodus of Polish intellectuals, of course state triggered, which earned the opposition of the university milieu. University circles began their underground activities. In 1977 came into existence the so called 'Flying Universities' and the 'society for Scientific Courses' was founded. Both got connected to the committee for the Defense Workers and began programme for open lectures in the universities. Through the independent Editions (Samizdat) large number of books were published which could not be cleared by the censor in the past years. There came a flow of new crisp breeze. Those books published from outside state

controlled press (Samizdat) became very popular, of course most of these books were in popular science and social sciences. Zasztowt (2009) claims that this 'samizdat' stream idea brought huge social change in Poland as it made a section of younger generation people reminiscent of the old traditional Polish culture and hostile to the communist regime.

In the beginning of 1980s, 10 million Poles chose freedom. Very few knew that science communication was probably one of the most forgotten and hidden elements to influence this process that resulted in the collapse of the communist system.

Having said so, we are now to present five case studies (of radical shade) of PSMs in India, based on data that are empirical as well as secondary source based. The case studies are PSMOs like; All India People's Science Network (AIPSN), *Bharat Gyan Vigyan Samiti* (BGVS), *Jana Vignana Vedica* (JVV) (all based on science activism through mobilizations), Eklavya (a PSMO with nuance, having a radical science teaching method implying pedagogic revolution and alternative curricula) and Delhi Science Forum (DSF) (purely discursive movement).

Methodological note: The analyses of five case studies are based on the use of both empirical and secondary data collected from these PSMOs through extensive field visits by the researchers. Further the five case studies do make a representative sample of the radical type PSMOs in India. Of the five one is the umbrella organization of the rest four and it flexes its muscle in the civil society domain with the help of media and intellectual resources. Of the four two are activist organizations which involve in grassroots mobilizations of people for science and the third one is also a radical organization that is suggestive of pedagogic revolution and mobilizations through school science teaching and novel teachers' training programmes. Of the four the fourth one is a voluntary organization, which is a critique of Government S&T policies and engages only in discursive type mobilizations through its intellectual resources.

Before we analyze the five case studies from the vantage of Resource Mobilization Theory, it becomes almost an imperative to explicate as to why these PSMOs be treated as 'social movement organizations', as per the theoretical requirements of resource mobilization theory by McCarthy and Zald' (1977, 1212: 1241). Following are the reasons: (i) Each of these organizations has a set of specific goals to attain, (ii) Each of these organizations has its own strategies, tactics to mobilize resources be it material or immaterial, (iii) Leadership (both from inside as well as outside) played a major role in each of these organizations, (iv) Each of these organizations also have small membership and full time staff intended to speak for an aggrieved section/group without involving the group itself, and (v) Each of these organizations also possess sufficient resources to strengthen the movement and to accomplish its limited goals. Further, the large number of PSMOs (those affiliated to AIPSN and those not) do make a strong 'social movement sector', in the true sense of McCarthy and Zald (1977). And the vast domain of social movements of various kinds prevalent in contemporary Indian society like, the environmental movements, protest movements against development induced displacements, tribal movements for rights over forest land, regional identity based movements, anti-globalization movements, feminist movement, and ongoing class based movements like the Maoist/Naxal movement etc make a perfect 'social movement industry' in the sense of McCarthy and Zald (1977). Thus a perfect 'social movement industry' subsumes a true 'social movement sector' which in turn is inclusive of several 'social movement organizations'. But it is need less to drive home the point that the resource mobilization theory focuses more upon the 'social movement organizations' for analytical purposes.

Case Study. 1: All India People's Science Network (AIPSN), An Umbrella PSM Organization

It has become popular to talk about networks in social movements generally and the science movement specifically. Indeed Diani argues (1995) that it has become the rule rather than the exception to talk about social movements as networks in recent years.⁸ This trend began, one could argue, with the seminal work of Gerlach and Hines (1970) on the loose, dispersed networks of social movements in the 1960s. Just after two decades, PSM in India created AIPSN, a network of organizations for science, environmental, education, health, social justice and civil rights organizations. Here in this paper we are not going to dwell upon too much on how the idea of AIPSN emerged and evolved over decades, rather we will analyze its strategies and how it made alliances as well as shared resources among diverse organizations. It thereafter discusses how networks like AIPSN created a space within the civil society; and how it advertised the movement's causes. Finally, it examines some of the difficulties in, and disarrangements of AIPSN.

The Conception and early Mobilization

The idea of AIPSN can be traced back to the very early days of a conceptualization of the people's science movement in India. The decisive intervention came through a Forum of Science Writers (later known as KSSP) in 1962 followed by The Science Writers' Association of India (SWAI). KSSP was confined to the language of Malayalam (spoken in the southern state of Kerala), while SWAI was, mostly in Hindi and English. In 1966, half a dozen other organizations came into existence in Bombay (now Mumbai), initiated mainly by scientists from establishments like Bhabha Atomic Research Centre (BARC) and Tata Institute of Fundamental Research (TIFR). It was the same year, when these organizations were networked into a Federation of Indian Languages Science Association (FILSA) led by M. P. Parameswaran ("MP", as he was affectionately called by the science activists), a left-leaning nuclear engineer. The headquarters of FILSA was located in BARC. Initially, FILSA took up popularization of science by translating into various Indian languages such as Malayalam, Tamil, Kannada, Telugu, Hindi, Gujarati and Marathi. However, FILSA was active only for two years, i. e. from 1966 to 1968. During its functioning period, even it didn't have a formal office and funding source. Only three workshops and half a dozen meetings held over this period. Even the then organizations under FILSA are almost dead now except *Hindi Vigyan Sabha* (Hindi Science Assembly). FILSA was the pre-formation of the present AIPSN. In a way, FILSA was the proto type of AIPSN. Therefore, these Bombay intellectuals who had pioneered FILSA and also KSSP were the 'Conscience Constituents' (McCarthy and Zald, 1977) of this SMO called AIPSN.

By the early 1980s, number of voluntary organizations in the field of S&T communication also emerged in different parts of the country. These organizations, through their mutual interaction and cultural capital influenced each other which empowered and equipped them to be relevant in communicating science in Indian context. In May 1985, KSSP organized in collaboration with other organizations from the Indian states like Tamil Nadu,

⁸ Diani's work, especially his definition of social movements as networks (1992), has certainly aided this trend in the sociological literature.

Karnataka, Andhra Pradesh, and Madhya Pradesh, an “*All India Shastra Kala Jatha*” in the memory of the innocent victims of Bhopal gas tragedy of 1984 (accidental release of huge toxic chemicals from Union Carbide factory). This *jatha* (caravan) was a resounding success. Fortified by it, KSSP along with 26 other like-minded organizations planned up a more ambitious project the *Bharat Jan Vigyan Jatha* (BJVJ: People’s Science Caravan of India) during September-December, 1987 which was later supported by the India Government’s Department of Science and Technology (DST). The *jatha* covered 500 places in 14 states of the then India and 5 million public in villages and small towns. Five *jathas*, with cultural (*kala*) groups from five different regions of the country, assembled in the city of Bhopal. Even a 2000 km procession converged at Bhopal from five different directions. The message was — “science for peace”, “science for humanity”, “science for secularism” and “science for self-reliance”. This was a massive attempt for science communication in Indian context to construct a culture of science through caravan. It also helped the expansion of voluntary organizations working in S&T communication into a network of people’s science organizations across the country. At that time, it was absolutely unique event and the largest experiment in science communication, ever undertaken anywhere in the world. It also was perceived as one of the greatest experiments in India’s history of radical S&T. Though estimates of BJVJ’s popularity are hard to gauge, it is fair to say that the *jatha* spread to both rural and urban India, and this *jatha* gave birth to a pan-Indian People’s Science Movement and led to the formation of the AIPSN.

From Mobilization to Institutionalization: Formation of AIPSN

It was born in 1988, as a loose coalition of PSMOs during the first All India People’s Science Conference, that took place at Kannur, Kerala. The objective behind the formation of AIPSN was to sustain the coordinated activities of all PSMOs in India and to bring together these PSMOs on a single platform. Thus it is a PSMO where several PSMOs found a point of convergence. Besides, AIPSN members include scientists, science journalists, science museum and science centre producers, academic researchers, public information officers working in scientific institutions, political activists, teachers, educators and many others interested in S&T issues. Conventionally the headquarters of AIPSN resides in the Secretary’s office because the organizational business is done by the Secretary of AIPSN. Currently, the AIPSN has been linked with 26 PSMOs⁹ from over twenty states (except in Jammu and Kashmir, and a few North-Eastern Indian States) and with a total membership

⁹ AIPSN Members are (as per 2008 data): *Jan Vignan Vedika* (Andhra Pradesh), *Assam Gyan Vigyan Samiti* (Assam), *Bharat Gyan Vigyan Samiti* (Bihar), *Bharat Gyan Vigyan Samiti* (Haryana), *Bharat Gyan Vigyan Samiti* (Himachal Pradesh), *Gyan Vigyan Samiti* (Jharkhand), *Bharat Gyan Vigyan Samiti* (Karnataka), KSSP (Kerala), *Bharat Gyan Vigyan Samiti* (Madhya Pradesh), *Bharat Gyan Vigyan Samiti* (Maharashtra), *Bharat Gyan Vigyan Samiti* (Odisha), Pondicherry Science Forum (Pondicherry), *Bharat Gyan Vigyan Samiti* (Rajasthan), Tamil Nadu Science Forum (Tamil Nadu), *Bharat Gyan Vigyan Samiti* (Tripura), *Bharat Gyan Vigyan Samiti* (Uttaranchal), *Bharat Gyan Vigyan Samiti* (Uttar Pradesh), *Paschima Banga Vigyan Mancha* (West Bengal), Society for Technology and Development (Himachal Pradesh), *Madhya Pradesh Vigyan Sabha* (Madhya Pradesh), *Navnirmitti* (Mumbai), Assam Science Society (Assam), Federation of Medical Representatives Associations of India (Kolkata), Delhi Science Forum (Delhi), Forum of Scientists, Engineers and Technologists (Kolkata) and *Eklavay* (MP).

of over 300, 000 spread throughout India. AIPSN has a reach in 18, 000 villages spread over 300 districts of the country. National level bodies like Federation of Medical Representatives Association of India (FMRAI)¹⁰ and Forum of Scientists, Engineers & Technologists (FOSET)¹¹ are also members of AIPSN. AIPSN along with the former have been campaigning for a Rational Drug Policy and access of essential medicines for Indian public and the close association with the latter towards a campaign for self-reliance of S&T in India. In totality, the birth of AIPSN is an outgrowth of a middle class movement which is closely linked to the opening of the Indian economy, first in the mid 1980s when curbs on internal capital were reduced and then in the early 1990s when foreign capital (with private corporations) was allowed to enter in India.

It organizes All India People's Science Congress (AIPSC), every two years. The biennial meetings used to bring together around 500–1000 science activists, local farmers, PSMO representatives and delegates from governments. The aims of the participants to share knowledge on S&T for sustainable development, identify new challenges, review their actions, interact with experts, and learn from each other's experiences and plan ahead. These meetings are interdisciplinary in nature. The topics of the Congress revolved around peace and science, women's empowerment, education and health, natural resources management, science and development. The primary objective of this Congress was to trigger collective thinking process for organizing a series of interactive sessions where in socially committed scientists from India's R&D institutions interact with local level institutions and meet their demands for technology, thus ensuring the well-being of the society. Thus, the intention of the Congress is to bring together for a dialogue, all those, who demand knowledge, all those who may be able to supply them and also those who can interpret such demands into the language of scientists. AIPSN also assists the National Council of Science and Technology Communications (NCSTC) of DST to organize the Annual Children's Science Congress.

AIPSN celebrated the occasion of 50th anniversary of Indian Republic in the year 2000 and focused the issue of science and self-reliance. It decided to hold five regional seminars on the issue of "Science and Self-reliance" in southern, eastern, north-eastern, northern and western regions of India. So far, there have been four regional conventions already held in Chennai (Southern), Calcutta (Eastern), Hisar (Northern), and Agartala (North-Eastern) respectively highlighting the issue of self-reliance and science in contemporary India. The AIPSN in the year 2010 stressed the need to develop an alternative trajectory of sustainable development against the neo-liberal economic policies. As the neo-liberal policies are bringing about massive inequality in the country, Amit Sen Gupta, current general-secretary of AIPSN urged scientists to fight against the 'anti-public' S&T policies. He further argued that the corporate forces have been trying to commodify science and research findings. Consequently the common public has been denied the fruits of the scientific inventions. B. Ekbal, a public health activist, said "the responsibility of the AIPSN had

¹⁰ FMRAI was first formed at Hyderabad in 1962 for improving the living conditions of Medical Representatives in India. It is the only national trade union of the Medical and Sales Representatives in India having its affiliates in each states of the country and offices in 300 cities and towns. FMRAI publishes its organ FMRAI News every month which has a circulation of 25,000 each issue. Further details see <http://www.fmrai.org/>.

¹¹ Forum of scientists, engineers & technologists (FOSET), started its journey in the year 1987, is presently having nearly two thousand conscious and socially committed scientists, engineers and related professionals in its fold directly as members and operating through 12 sub-centres scattered in and around the state with its central office in Calcutta (now Kolkata).

increased against the backdrop of environmental deterioration with the potential of ecological disasters in several parts of the country". *People's Science*, a bi-monthly magazine, is being regularly published by AIPSN since 1999. This magazine is the mouth-piece of AIPSN where member PSMOs share their ideas, style of functioning of various PSMOs, and the discourse on various related issues to AIPSN.

Organizational Resources

Ideological discourses & worldview: AIPSN's ideology is predominantly based upon the discourse of the Left, which has made a strong imprint on, for instance, the choice and the definition of the themes for its meetings. This use of a very particular discourse — more commonly, the use of language, the choice of terms, and an approach to analysis — has also played its role in alienating even those who may feel sympathetic to Left opinion and positions but do not feel themselves as *being* part of the Left and do not want to be fitted within the leftist discourse. AIPSN is antagonistic to the ideology of *Sangh Parivar* (right-wing ideology) of India. Consequently, it rejects the PSMOs endorsing explicitly/implicitly right-ideology leaning. The confrontation between AIPSN and *Sangh Parivar* is apt when a conclave of the *Sangh Parivar* way back in 2003 had termed this umbrella kind of network as an emerging threat (Jayan, 2003) and in response to this a prominent AIPSN activist said "it shows we are moving ahead in the right direction". It claims that most of its agenda appear to be perfectly compatible with a Gandhian free-market approach of nurturing economic entrepreneurship and independence at the community level. It further argues that if the right wing fails to see Gandhian entrepreneurship as free-market that is their own failing. Ideologically AIPSN does a great amount of balancing, as it claims to be believer of Gandhian economy but has a strong leftwing political affiliation.

AIPSN is a fairly extensive network which is committed to the use of science to promote science for *equitable* and *sustainable* development. It believes that the public needs to develop a critical understanding of S&T in order to be able to participate in the application of S&T, especially in the choice of technologies in different contexts. Given the widespread literacy, the efforts to propagate science awareness and create a 'scientific temper' among the people should go hand-in-hand with efforts in mass literacy. The PSMOs affiliated to this network vary from each other in terms of their size, specific and local level initiatives. AIPSN plays an instrumental role towards establishing a strong relationship among various PSMO activists. The success of BJVJ led AIPSN to take up literacy as an empowerment programme in the campaign mode, for which it has set up a separate organization called the *Bharat Gyan Vigyan Samiti* (BGVS) (Indian Science Knowledge Association) with the primary responsibility of placing 'literacy' on the national agenda. Malcolm S. Adiseshiah became its founder president and MP Parameswaran served as secretary along with several leading scientists, technologists, educationists and social activists as its members. It was acting as a crusade against illiteracy conducted by AIPSN and supported by the Government. Indeed, literacy campaigns later on formed an essential component of almost all the PSMOs of India.

AIPSN expands the scope of science by taking it beyond just the study of external nature on which the laboratory experiments are carried out. To them it also includes the environment that people live-in, work, and play-in. It addresses 'S&T' issues as they relate to a broader

agenda which includes development projects, environmental pollution, occupation health hazards, health care, drug abuse, the danger of nuclear war and other issues of social and economic justice.¹² K. K. Krishnakumar, executive member of AIPSN, said that ‘although the AIPSN had grown remarkably in the last decade, it has faced new challenges and issues in the context of globalization and the rise of communalism. Because of this linkage of issues it is also argued that AIPSN is not strictly confined to deal with science. Instead, they challenge multiple lines of domination, and it is difficult to discern where the science part of the struggle begins and where it ends’ (address at the 9th Congress of AIPSN, Dec 19–22, 2001 at Chennai).

Such understanding of science activism with diverse issues and an assertion of linkage calls for a broader movement — one that must necessarily forge a camaraderie among a range of organizations and movements. AIPSN provides for a platform cutting across issues and organizations. It is a key characteristic feature and organizing strategy of the umbrella PSMO. Examples of these issue based linkages, and the concomitant networking, are numerous. Individual member organizations of AIPSN often deal with the interrelationship issues among the state, science and development. Activists battling with nuclear power projects often have to deal not only with issues of contamination, but also with the politics of power and exploitation by the capitalist countries. Of late, whether on the RTI (Right to Information) or the debate on genetic seeds, AIPSN in collaboration with NGOs, has sought to experiment with participatory frameworks where stakeholders openly debate the politics of expertise. AIPSN — if seen as a body of activists and lobbyists — contribute greatly to the intensification of the controversy over S&T in which they bolster and augment their arguments or reasoned out opinions with non-scientific discourses such as human *rights*, democratic governance, *colonialism and imperialism*, postcolonial or post-independent *development*, and *globalization*.

External and Internal Resources

Internal linkages, Making alliances, Sharing resources & Role of intellectuals: Networks and alliances in the PSM depend as much on their differences and autonomy as they do on unity. In the formation of AIPSN, this is an important notion that there is not necessarily one single unifying commonality, a single glue or mortar. Instead, a network holds itself together along the common edges of its pieces — where there is similarity or solidarity. The resulting mosaics itself — the movement-becomes the major reflection of commonality. Within a network, there remains both multiplicity and commonality. Organizations that share PSM concerns may still have radical differences. Yet the commonality of PSM experiences serves as the mortar, even when there are differences in ideology, style of functioning, and tactics or strategies. Respect for differences goes hand in hand with the building of an alliance. For example, even the constituent PSMOs of AIPSN are not having same priorities. Some are working chiefly on science popularization in vernacular and local languages, a few

¹² An initiative of the Tamil Nadu Science Forum (TNSF), for instance, has been the reclamation of abandoned large water tanks across the State in order to make them usable once again. The Pondicherry Science Forum (PSF) intervened effectively in the unbridled practice of aquaculture in Tamil Nadu, which was causing severe damage to the coastal ecology. This resulted in the enactment of a regulatory framework. The *Himachal Gyan Vigyan Samiti* (HGVS) has initiated a project to study the frequent occurrence of flash floods in the State.

are constantly working for alternative models of development and decentralized participatory planning, and another few are involved in translating public's aspirations in Weberian bureaucratic terms for policy advocacy. Part of the crucial task of building network is building cooperation across numerous groups — geographic, cultural, gender, social, ideological — and numerous organizations have come to see part of their task as the building bridges between/among diverse organizations (Anthony & Cole, 1990: 1–2; Williams, 1993: 18).

AIPSN acts as an interest group pushing for plausible legislations. However, its political strategy of networking strengthens the movement with the mobilization of divergent groups. Networking provides a movement many points of attack, positions from which to argue, and tactics to use, while helping to pool resources efficiently. Local PSMOs involved in a project, campaign, or action require a variety of resources. PSMOs need technical information, advice on, and analysis of specific issues. Assistance is needed on organizational issues like, structure, leadership and participation. Assistance is also needed either in the form of advice on locating funding sources or getting direct monetary support. And there is always the issue of how to approach, use and deal with the media. It is the networking of AIPSN which makes the mobilization of resources possible externally, by linking with other groups or networks that can provide for various access points to resources.

The internal sharing of resources is one of the basic reasons for organizing networks. AIPSN can be seen as a 'support mechanism' that assists thousands of grass-roots PSMOs around the country. But resources flow not only from the centre to the network outward, for example, from the main office of AIPSN, but from organization to organization within AIPSN as well. One PSM activist argues that the point of networking 'is that we can teach each other. And that is how we begin to pool resources, monetary, intellectual and strategic'. Network also helps in exchanging ideas and pooling of resources of various kinds from among PSMOs to assist one another with their respective expertises (e. g. with expertise in law, in government processes, or in particular areas of S&T policy research etc).

AIPSN is a network full with intellectuals who are practitioners of certain professions uniting together by mutual consent to deliberate, determine and act jointly for a purpose. As a result, AIPSN is full of cardiologists, public health professionals, scientists both physical and biological, engineers, lawyers, economists, even creative writers or other professionals, who feel at ease in deliberating, determining and acting jointly towards the dissemination of scientific knowledge. These intellectuals are largely involved through voluntary action, with a view to establishing their identity in which these intellectuals have a common interest. These intellectuals are an important component of the AIPSN because the network provides them with an opportunity to express themselves outside the public system of S&T (establishment) which is well organized. The network being part of the civil society within a democratic polity acquires *suo moto* the role of a stakeholder. Hence these intellectuals work proactively through AIPSN and use it as a platform to contribute to the public domain. This helps in bridging the gap between science and society as the criticism brings out the social relevance of the scientific issues to the forefront.

External Linkages, Acquiring Media Favour: New social movements have moved much ahead over the last few years, in the direction of involving media and public communications. They demand democratic access to the media in order to be on even ground with the rest of the news sources. And if they are denied of this right, they immediately set out to conquer it as they believe that being part of civil society the public sphere belongs to them as well. The media is an inseparable part of AIPSN's protests, sit-ons and demonstrations. Of the various technological tools, AIPSN have found the internet as the perfect platform

through which it tries to reach out its audience. However, its biennial conferences are largely ignored by the mainstream media. The collective mobilizations by its constituent PSMOs usually gets due coverage in the print media. Often, PSM sympathizers write on the role of AIPSN, its struggles and its wider implications. Since the mid-1980s, there has been a virtual explosion of PSM writings in English and Indian language newspapers and magazines.

AIPSN and its external linkages with the civil society: Social movements work as a network and defend collective interests which frequently lead them to clash with the establishments of powers that be (Piscina, 2007: 66). AIPSN is an umbrella kind of network organization involved largely in science activism in India. Since it is a social movement, it is generally conceived of as instantiations or elements of ‘civil society’. The term civil society is applied to the group of social movements and voluntary organizations that is not linked to the State and economic world (ibid). The question of the origin, or provenance of ‘civil society’ has been a subject of extensive debate, especially about the meaning, applicability and use of the idea of civil society in non-Western contexts like India (see, for example, Bteille, 2000; Chandhoke, 2001; Deakin, 2001; Ferguson, 1980; Gellner, 1990; Howell and Pearce, 2001; Khilnani, 2001). AIPSN’s slogan “Another world is possible” in the context of anti-globalization brought a new paradigm into force. It is said that some sectors that are in favour of institutional reform place emphasis on the word “possible” more than “another” whereas another significant, growing trend turns the terms around and emphasizes “another”. The latter took up the ideas of the anarchist anti-capitalist movement and proposes a socio-political method of organization on establishing networks with a popular base.

Disparagements & Debates: The various roles of AIPSN as a ‘network’ activities, lacked coordination and did not have the kind of impact it could have had nationally, or even at the state-level. Each organization did it in its own isolated way, as one among its other regular activities. Many PSMOs although agreed to launch common programme activities/actions, failed to do so. There were no indications of any attempt to widen or expand the group by inclusion of more members. On the contrary, there were reports that PSMOs desirous of joining the network failed to elicit any response. Towards the end of 1988, it became quite clear that the AIPSN had no intention of letting any other agencies join the network. It was at this juncture that NCSTC, DST’s autonomous body, decided to make a move for a draft proposal towards the formation of NCSTC-Network. This proposal was also presented in the “NCSTC Communications” issue of January, 1989. Currently this newsletter circulates every month to over 5,000 addresses, including all voluntary organizations on NCSTC’s S&T communication database.

Separate and parallel efforts were made by the NCSTC to elicit views and suggestions on the draft proposal from the 26 PSMOs which had assembled for the *Bharat Jan Vijnan Jatha* project, not once, but several times; however it was of no avail. Only a fraction of the 26 organizations responded; others did not even bother to acknowledge the receipt of communications (after repeated reminders through speed-post and circulation of copies of the draft proposal at the Second People’s Science Congress at Calcutta during mid-March 1989). In fact, the Second People’s Science Congress concluded without discussing issues or questions in this regard which had been left unanswered at Kannur event even though AIPSN member organizations were present. The views and suggestions of AIPSN member organizations were characteristically different from those of the other organizations. According to AIPSN, the structuring of the network may lead to erosion of voluntarism, freedom of action, and autonomy of member organizations. The threat of withdrawal of membership, on not performing “network functions” could lead to undesirable trends. Such a thing is likely to be harmful to the commitment and devotion with which voluntary organizations work. The very

style and character of functioning of the voluntary organizations may get adversely affected through rigid structuring and compulsion in performing tasks and functions which may be in basic disagreement with PSMOs' philosophy and ideology. The AIPSN members perceived this as the Government's effort to coopt this voluntary movement with radical teeth.

On August 17, 1990, various Govt./semi-govt organizations including PSMOs were invited afresh to join the network named NCSTC-Network. Unlike AIPSN, this network was registered itself with the Registrar of Societies Act, 1860 with a governing body and office bearers. Of the original 94 applications received 34 were retained after scrutiny to become members. Of the 34 members of the NCSTC-Network, nine were also members of the AIPSN. Over the years, the membership of the NCSTC-Network has grown to over sixty now.¹³ In this, at present, there are 13 members who also are members of the AIPSN. About a fourth of the members are government or semi-government organizations (both of the central and state varieties) and remaining ones are registered voluntary organizations of good standing in their own right. The oldest among them is the *Bangiya Bigyan Parishad* (Bengal Science Association) which was formed way back in 1948 and the largest number of Network members is in the State of West Bengal.

In (formal organizational) structural terms, however, the structure of AIPSN is dominated by one particular stream of ideological discourse, the left, as represented by the DSF and the BGVS. The organization that is by far the most dominant in AIPSN is the DSF and the latter is also affiliated to the CPI (M). Some of DSF members have been the members of CPI (M) periodically. The DSF and the BGVS together have made extensive use of the available people and network bases, including physical infrastructures and funds of the AIPSN. No other organizations have been able to do this. It can be argued that at times their dominance is not surprising and in some ways even well 'deserved'. But the problem with the dominance is that the expression of a difference of views are suppressed, if not actually eliminated, and others with more independent points of views, keep away when they see this character of AIPSN. Our understanding is that this has happened in AIPSN quite often. For instance, both the DSF and BGVS never accepted the *Marathi Vidyan Parishad (MVP)* (Marathi Science Association) as a PSMO. There is the tactical question of whether simply taking a position that one must keep the MVP out of the AIPSN, by not inviting them to participate, can ever be sufficient to achieve the objective. There are two questions here: one, the question of the problematic of open space, and two, the question of boundaries and exclusiveness. The two questions are of course interrelated. It is correct to feel that MVP by character and ideology is different from those left wing network organizations. And more importantly MVP has a large pool of highly qualified and accomplished scientists and engineers, some of them are of very high repute and served high positions, who may not necessarily share the ideological underpinnings of AIPSN, but have to be given space in this radical activist forum.

Case Study. 2:

Bharat Gyan Vigyan Samiti (BGVS) a PSM organization for Literacy

The conception of BGVS could be articulated in the backdrop of *Bharat Jana Vigyan Jatha* (BJVJ) of 1987 led by KSSP. In the next year 1988 AIPSN was formed. Having seen this success of mobilization for literacy, when KSSP was preparing the Total Literacy Campaign

¹³ Further details please see <http://www.ncstc-network.org/>.

in Kerala, the Govt. of India (through advisor Sam Pitroda) approached M. Parameswaran to help out in national literacy campaign. Parameswaran and group agreed and organized 400 buses and visited 60,000 nodal villages. But to take it beyond and organize as well as operate such a nationwide literacy campaign, the concurrence of National Literacy Mission (NLM) was taken. It was agreed to form an organization named BGVS (in the footsteps of BJVJ 1887). And the NLM authority became the sponsor of BGVS. The project was approved by MHRD (GOI) and with MHRD representatives in the council the organizational framework was setup and it became functional in December 1989 with noted educationist Malcom Adiseshaiyya as the then chairperson and Parameswaran as the then Secretary.

Further, in order to understand cognitive process of formation, it may be useful to divide the BGVS into three major phases with defined characteristics. The first phase, from 1989 to 1993, a period of awakening, was characterised by mobilizations for literacy, starting from the formation of the BGVS of 1989 followed by three major *jathas*, like *Bharat Gyan Vigyan Jatha*, Nov. 1990, *Samata Jatha* in 1993 and a nation wide campaign called *Hamara Desh* (Our Nation) in 1993–1994. The second phase, from 1994 to 1997, a period of movement building, was marked by a transition from literacy to other development initiatives and an attempt to establish a strong interface between the two. These were mainly in the areas of natural resource management, health, initiatives in basic education and the generation of social awareness through publications and the formation of saving groups. After having organized major programme on development of local economy, natural resources, called *Desh Ko Jano, Desh Ko Badlo*, (Know the Nation and Change the Nation) and BGVS went for major women's mobilizations through *Samata Vigyan Utsavs* (Samata science festival) from 1996 to 1998. Of course during 1995 BGVS had organized a huge scientific awareness building campaign called 'Cosmic Voyage' on the eve of 24 October, 1995 total Solar eclipse, in the north India. The third phase, from 1998 to the present, is defined by an attempt to consolidate through decentralized institutionalization, around continuing education centres and *Gyan Vigyan Vidyalayas*, i. e. centres of non-formal education and interface with formal schooling.

An assessment of the history of BGVS (Saldanha, 2003) suggests that there were two primary factors that influenced its trajectory; the external environment and the organizational dynamics along with strategies internal to BGVS. Factors related to the external environment may be seen as those related to the socio-economic contexts of intervention and those resulting from the interactions with the other major agency in the literacy campaigns, e. g. state/government. The strategies of the BGVS were largely in response to the spaces provided to it by the government.

The Organizational Resources

Perspective and Ideological Formulations:

Given that the process was visualized as being essentially democratic in character (towards strengthening people's power), it was clearly conceived as being a people's movement with the collaborative participation of various sections of society, at most time on a voluntary basis, i. e. with no payment for part time services. The intervention of BGVS was primarily within the social developmental sector, generally considered as a sector with low political legitimacy and salience. The long term perspective of the BGVS was influenced

by the issues of egalitarianism and social change thrown up by its actors. Of Course a few of them believe in being part of the political economy of agitation-based struggles on livelihood issues (land, resources and distribution) and the political representational struggle of an electoral character. The key perspectives of BGVS are explicitly as follows:

1. *Equity and Self-Reliance*: Access to literacy and basic education itself was seen as access to equal opportunities. A perspective on self reliance was especially required in a growing unipolar and militarized superpower context and where other basic educational programmes were tending to be flooded with 'foreign aid'. This perspective was increasingly being influenced by liberalization and privatization of the economy in contexts of globalization. It further justifies the restructuring of economies and innovation in communication and knowledge distribution.

2. *A People's Movement Approach, Decentralized Democracy, Secularism and National Integration*: The mobilization process and organizational structures for implementing the literacy campaigns emphasized these values. The very structure of Village Education Committees was an operationalization of this principle where an attempt was made to put together major social forces such as the government, the voluntary organized and unorganized sectors and the teaching-learning community. Secularism and national integration were important in a context where dominant national hegemony was increasingly being influenced by sectarianism and communalism.

3. *Voluntarism and Scientific Awareness*: The main body of the literacy campaigns worked on the principle of voluntarism. This involved at different times over more than a decade, voluntary activists that might number over 10 million persons. Involving these persons in acting through popular, electronic and the print media in the spread of literacy and critical scientific awareness was one of the important features of the literacy campaigns.

The Organizational Structure

Having been founded in 1988 and located at New Delhi, BGVS is now having branch offices in 22 states of India. It has outreached 306 districts, 2009 blocks and 21064 *Panchayats*. Its general body consists of 100 members (3 members from each state, 13 Executives Committee (EC) members, outgoing EC members and 15 EC nominated members and two invited members from the AIPSN). It has 13 members EC with a Chairman, a Secretary, and representatives of NLM. As it started with the then government of India initiative, it made use of Government infrastructure, and received indirect support for its literacy campaigns, its status as a PSMO is questionable. Even if a radical ideologue like MP Parameswaran is providing leadership to BGVS even today, its radical teeth and identity as a voluntary PSMO is at stake. This could easily be perceived as Government of India's effort to co-opt the radical ideologue and his campaign.

Objectives of BGVS

The objectives of the BGVS are very broad to cover the entire spectrum of socio-economic political issues. These macro objectives also reflect the nature of this *Samiti*. BGVS has concretized these objectives in the form of certain specific programmes, but it remains largely a movement for the comprehensive restructuring of society. It is a nation-wide mobilization leading to a mass action. It aims to communicate the basic problems such as water, nutrition, health, environment and literacy through a self-reliant, humane, participatory process and a scientific approach. Further it directly addresses these basic problems through deeper intellectual interaction with physical environment. It promotes the formation of

groups at the *gram panchayat* (village local bodies) level, block level, district level under the three tier system of *panchayati raj* institution (PRI) that will understand the use of S&T for the benefit of the common man. To make the movement sustainable BGVS has a participatory resource mapping system which allows people with the help of scientist to identify all natural and human resources in their *Panchayats* and plot them on revenue maps to be subsequently used by them for local development planning.

Mobilizations; Campaigns and Strategies

The technical dimension of the BGVS consists of the tactics, strategies and techniques of protest such as campaigns and mobilizations through which the specific objects are opposed. The two kinds of tactics used by BGVS include *jatha* and *kalajatha*. In *jatha*, there will be approximately 12 to 15 amateur performers, elocutionists and the like in two groups, selected from various districts on the basis of acting and speaking ability. They hold a camp to develop the ideas to be presented, the scripts, the roles, and to learn their parts. The puppet plays, short plays and songs they develop would constantly be revised on the basis of group and self-criticism. To minimise costs, events are held in locations as close as possible to major routes, e. g. National Highway. The objectives of *jatha* are to promote scientific thinking and awareness of society's problems through the arts that the people of India can understand and identify with.

The very idea of *Kalajatha* for science communication began to evolve in KSSP in 1977 while conducting a science cultural caravan. The first *Kalajatha* was launched in 1981 and still the people's science movements in India consider it as an effective method to reach common masses (Narayan, 1999). The *kalajathas* were developed during the 1977–1988. It consisted of displays of posters, banners, hoardings, stickers; *padyatras* (marching on foot), street theatres and songs. The *Kalajatha*, a powerful medium, that packed its messages in the popular cultural idioms and forms, its message was hard hitting, linking literacy with many basic livelihood problems and even with questions of exploitation, oppression and discrimination against women. They attract an audience and convey messages in an aesthetically pleasing and emotionally inspiring manner. Importantly, cultural events create a forum for meeting, discussion and planning. The experience of the *kalajathas* indicates that traditional cultural forms generate the requisite social energy for a mass mobilization like the literacy campaigns. The messages and the cultural forms that were utilized demonstrated a healthy combination of centralized initiative together with decentralized creativity through adaptations. According to Dighe et al. (1991: 84), the ideological thrust of the *kalajathas* was such that the problem of illiteracy was for the first time being perceived from the perspective of the poor.

The BGVS used different strategies for raising people's awareness on various scientific and social issues. These strategies were:

- developing a set of centralized messages but allowing for enough flexibility to encourage adaptation to suit local needs, problems, aspirations;
- evolving an organizational structure that is pyramidal in nature with a broad base of activists at the local or village level tapering off to smaller numbers at the taluk, district and state levels;
- involving activists on a voluntary basis and sustaining their missionary zeal through on-going training;
- undertaking meticulous planning of activities and time schedules to be followed, but allowing for corrections and modifications on the basis of feedback received from the people;

- involving leaders and workers of political parties irrespective of ideology, and eliciting their involvement and participation in the programme;
- carrying on the whole campaign, in a time bound period, i. e. almost on a ‘war footing’ and sustaining the tempo of the campaign and finally;
- involving the entire community in different ways, thus generating a mass support for the programme.

The major initiatives involving large scale popular mobilizations on the part of BGVS were: The *Bharat Gyan Vigyan Jatha* of 1990, *Bharat Jan Gyan Vigyan Jatha* 1992, The Campaign for *Hamara Desh* 1993–1994, *Samata Jathas* 1992–1993 (Samata network, Samata Vigyan Utsav), Science Popularization Activities: JOL and Cosmic Voyage 1994, *Gyan Vigyan Vidyalaya* Movement (2006–2007), People’s Health Programme (*Jan Swasthya Abhiyan*) 2003–2004, People’s Reading Programme (*Jan Vachan Andolan*) 1994–1996, and Developmental Action Programmes 1990s, Watershed development programme 1997, Integrated Drinking Water and Sanitation with People’s Participation (WATSAN) 1993–1994, Watershed Development Project 1995–1999, Science Communication programme on the occasion of Transit of Venus on June 8, 2004, Observing International year of Astronomy-2009, *Rozgar Adhikar Yatra* (Right to work caravan) 2005, *Janadhikar Kalajatha* (Right to information Caravan) Nov. 2007, Campaign against Female foeticide 2007, and 100 years of International Women’s day March 2010 etc.

Intellectual Resources

Intellectuals have played a pivotal role in social movements and are continuing to shape ideas and beliefs of the SMOs. Their major role is to articulate and couch the terms of the movement for making a broader appeal. For instance, BGVS was seen mobilizing a wider support for a people’s science movement. In our study of BGVS, we have identified a range of intellectuals who have been united in the social space created by this movement. In BGVS, intellectuals come from diverse social origins such as teachers, educationists, literacy activists, medical professionals, technocrats etc and hence their orientations were different. M. P. Parameswaran, Vinod Raina, K. K. Krishnakumar, Malcolm S. Adiseshiah, Venkatesh B. Athreya, T. Sundaraman, Komal Srivastava, and Kuldip Singh Tanwar are the intellectuals involved in BGVS. These intellectuals who make the ‘Conscience Constituents’ and ‘Conscience Adherants’ (McCarthy and Zald, 1977) of this PSMO, agreed that the nature of organization to be a mass based movement.

Case Study. 3: *Jana Vignana Vedika*: A PSM Organization

The Genesis and Objectives

Being greatly inspired by the *Bharat Jana Vigyan Jatha* (BJVJ) 1987 of Kerala, *Jana Vignana Vedika* (JVJ) was formed on February 28 (national science day), 1988 by a group of intellectuals comprising of academics, medical doctors, scientists, and teachers at Vijayawada in Andhra Pradesh. The formation was as a result of the idea gathered from the BJVJ, 1987 with the following set of objectives:

- To popularize science and to promote scientific temper among public;

- To eradicate obscurantist, superstitious and paranormal and mystical practices from public by means of popularization of science;
- To understand the scientific basis behind several of the problems faced by the public and to explore remedial solutions for the same;
- To facilitate the benefits of science among the larger public which are otherwise confined to the certain section of the population;
- To encourage quest for knowledge and to strive for national integrity, self reliance, world peace, social progress and cultural vibrancy;
- To encourage research in divergent areas with public welfare;
- To design programmes corresponding to the objectives set as above.

Organizational Resources and Domain

JVV is widely acknowledged as a PSMO in Andhra Pradesh and at present JVV have more than 30,000 members. JVV is a non-governmental and cadre-based PSM organization with its units functioning actively in all the 23 districts of the state of Andhra Pradesh. It is a constituent member of the AIPSN and also linked to the BGVs. It relies on the philosophy of volunteerism and its funding comes from individual donations and through projects. It has a 4-tier organizational structure, i. e. village/local unit, mandal unit, district unit and state unit. Every unit holds Conferences once every two years and elects the respective committees. It's membership strength is now more than 40,000. The State Conference is held after the lower units are done in with their hierarchical order. Neither the President nor the General Secretary holds the post for more than one term consecutively. It organizes a variety of programmes to create awareness and to draw the public attention on various socio-scientific issues. It also conducts training camps for teachers, students and science volunteers on the trends of S&T. It wages relentless but peaceful struggles against all kinds of superstitions and obscurantism. It elicits public opinion against the rhetoric of paranormal, quackery, unhealthy and spurious medical practices and other unfounded claims of prevention and cure. It educates public about ecological balance and sustainable agricultural and industrial development while uncovering the real culprits behind the abuse of the environment.

JVV's Perspective on Science and Society

Being a leftist PSMO, JVV views that Indian society is divided into two classes: the exploiting and the exploited. It opines that the powers and capabilities of S&T have been under the control of the exploiting class. Thus the advantage of S&T are being enjoyed exclusively by the exploiting class of the society while the exploited majority class, the producer of science and technology is bereft of its advantages. Whenever its control over the productive forces is likely to slip, the same exploitative class abuses S&T to unscrupulously arm itself with war machinery and jeopardizes the world peace. JVV draws its functional ideology to negate this lopsided, unscientific and unjustifiable social order fogging the S&T spheres of life. Hence, JVV's main slogan is 'science for Socialism' (science for self-reliance). It considers that popularization of science and promotion of scientific temper among people would sensitize and empower them to usher in a new public-friendly and democratic social order sans exploitation.

Intellectual Resources

JVV has been led by a group of intellectuals, but the most active leadership has been provided by academicians and scientists who come from several universities of the Andhra Pradesh like, Osmania University, ANG Agricultural University, National Institute of Technology Warangal, CSIR laboratory like CCMB Hyderabad etc. To name a few of the academicians involved were Profs. Balasubramanian, K. Venkat, B. N. Reddy, L. Pratap Reddy, N. Venugopal Rao, P. K. Satya Prasad, L. Muralidhar, A. Ramachandiah, K. Vijaylakshmi, and Ch. Mohan Rao. These academicians/scientists could rightfully be treated as the 'Conscience Constituents' and 'Conscience Adherants' (McCarthy and Zald, 1977) of this PSMO.

Activities of JVV

JVV involves in three kinds of activities such as: educative, agitative and constructive and such activities spread over areas like environment, health, education, energy, development, literacy, science awareness, campaigns against retrogressive social practices such as untouchability, child marriages, superstitions etc. JVV works on mainly issues related to science and society, however, education, health and science communication are the major three operational domains of JVV.

JVV and Education: With the strength of several thousands of teachers as its members, the JVV organizes teachers' training to make them enjoy teaching and promotes pedagogic innovations to make learning an enjoyable activity for children. It also assesses curricula contents, textbook contents and concepts. It also organizes children's science festivals, such as joyful learning, *bala melas*, (children's fair) etc, frequently on massive scales. To promote quest for knowledge and bent of socio-scientific and technological awareness among school children, the JVV has been running the largest circulated Telugu children's science monthly magazine, *Vidyarthi Chekumuki*, since 1990. It conducts Chekumuki Science Talent Test in every year for high school children. As many as half a million students participate in this test. The Literacy Movement, spearheaded by JVV, and one of the many short stories written by V. Balasubrahmanyam (its former General Secretary and Executive Member of the AIPSN) for the illiterates, sparked the anti-Arrack movement in the Andhra Pradesh. It has been a milestone in the successful chronology of events of *Jana Vignana Vedika*.

JVV and Health: Over the last few decades, JVV has actively been campaigning for people-oriented healthcare health policies. Led by a group of committed medical professionals and science activists, the organization conducts surveys and analyzes the ground realities of healthcare at all levels while preparing village level health plans and cost-effective solutions. As an active partner of *Jana Swasthya Andolan* (People's Health Movement), JVV has been critically examining the health policies of the government of Andhra Pradesh and formulating alternative health policies.

JVV and Science Communication: Popularization of science and inculcation of scientific temper among the people is JVV's major task and priority area. Its modes of popularization of science among people include use of folk arts, street plays, dance, magic, sound and music and other art forms besides the usual lectures, book exhibitions, demonstrations, debates, presentations etc. JVV's TV programmes against the godman Satya Sai baba in vernacular medium were well known. Even note worthy was JVV's initiating legal action in Andhra Pradesh high court against the Goud brothers for not revealing their method of curing Asthama (suspected of practicing faith healing).

Some of the activists of JVV regularly contribute articles and science features in vernacular media (both print and visual) and magazines. JVV has developed a series of radio episodes on the chemical sciences and other areas of science with a collaboration of the DST's *Vigyan Prasar*. Whenever astronomical events such as eclipses, meteors, comets etc occur, JVV goes to people at their habitats and make them understand the underlying principles of such phenomena lest they should attach obscurantist attributes to those and continue to be eternal slaves of paranormal and superstitious belief systems. It earned the National Award 2005 for the best efforts for S&T communications. In recent times JVV is actively campaigning against the use of asbestos for housing purpose and also India's growing nuclear power projects.

JVV and Publications: JVV has published many books and literature for children and adults. One of the major strengths of JVV is its publication wing. It has been publishing and circulating different kinds of books on science, culture, history, education, health etc for all levels of people. Promoting reading habit among the childhood has been a regular and ongoing activity of JVV. It organizes book exhibitions, reading festivals and readers' clubs. Most importantly, it publishes and circulates booklets, pamphlets, bulletins contextually too whenever socio-scientific, natural or astronomical events take place.

JVV and Women: Samatha is the name of the women's wing of JVV. It strives to empower women so that they are aware of their rights, sensitive to their problems and prepared for the remedial measures. JVV organizes frequent counseling and teachings to educate adolescent girls about mysteries surrounding their own physiological changes such as menstruation, sexuality, pregnancy, menopause, and aging. These are experienced as fear and taboos. JVV felt that women's health issues hadn't become one of the main activities of PSM and there was a need to explain to women in a simple way all of their physiological functions and changes, which JVV did undertake. *Samatha* opposed the sex-determining technologies in Andhra Pradesh on the health ground. Other than the risk of late abortion, normal health services pose a health hazard for Women. *Samatha* supported the Forum Against Sex Determination and Sex-Pre-Selection, formed in 1985 in Bombay, which sought ban on the sex-determining technologies and female foeticide. The nine years of campaign eventually led to the national laws in 1994 for banning the practices of sex-determining technologies and female foeticide. The *Samatha* and PSM activists welcomed this law as a first stepping stone towards women's empowerment. They, however, did not question who would benefit from these laws. Their campaigns did not address the basic question of power balance between men and women, the existing patriarchal relations within family, economic dependence of women, and the role of women in society.

JVV and Campaigns against Environmental Issues: JVV organizes several kinds of programmes to bring in awareness of environmental degradation, ecological balance, sustainable development etc, among public policy makers. It sensitizes people against the ruthless consumption of natural resources. With the National Forest policy of 1988, JVV educates the villagers how to manage their forest. With a pro-poor people discourse, it even supports industrialization and technological automation.

External linkages of JVV (with civil Society and state)

Apart from linking itself to other PSMOs, JVV maintains widespread linkages with several civil society organizations like, Sri Ram Rural Educational Institute, SCOPE, CMS India, Association for Human Development (catalyst project), Council for Science Editors,

Centre for Science and Environment New Delhi, Human Rights Forum, and with semi-government organizations like *Vigyan Prashar*. JVV also works in close cooperation with the Govt. Of India's ambitious school education programme named the *Sarva Shiksha Abhiyan* in Andhra Pradesh.

Thus it seems JVV is not different from other radical PSMOs of AIPSN. Above all those PSMOs that have affiliation to the umbrella organization named AIPSN do share their ideology and desired end state. Hence it would not be surprising to observe that they work on similar action programmes, of course with minor variations.

Case Study. 4: Delhi Science Forum (DSF) a Unique PSM Organization (for S&T Policy Critique)

Genesis: The government does indeed make some good and progressive policies, but through the implementation, these policies get distorted over the period of time. The state does not consult the people and its organizations while framing policy, yet expects these organizations to assist in implementation. Even when the people's organizations come forward to help in implementation of some progressive policies, this is soft peddled because the real agenda of the state is often different from the rhetoric. In certain cases where the people's organizations are consulted for policy formulation, this is carried out at the abstract level, and when the concrete policies are framed, the state reverts to its own pro-capitalist agenda. In this context, making the right noises is not enough; rather what is needed is a political will of the government to implement a people's agenda. In this backdrop, the genesis of DSF was realised as a PSMO in Indian context.

DSF is a noted PSM organization concentrating on policy issues related with S&T. Though it started functioning in 1978 but was registered as a non-profit public interest organization under the Societies Registration Act in 1981. The organization is based in New Delhi. It is engaged mainly in issues related to S&T policies and science popularization. DSF works in areas of interface between science, technology and society, focusing on S&T policy issues, their impact on India's self-reliance and sovereignty, and their societal implications, particularly regarding interests of underprivileged sections of the Indian society. DSF also works to promote peace and disarmament, utilization of S&T for environmentally sustainable development and a scientific temper including awareness of the potential of S&T. Unlike KSSP and BGVS, DSF is not a mass organization. It is a catalyst organization and the movement it runs is of discursive type only. It is not a mass based organization; rather it is a nodal agency among other PSM organizations in India. In fact, it is a pressure policy group among people's science movements in India.

Organizational Resources

Philosophy and Ideology of DSF:

According to DSF's philosophy, development is long-term, sustainable and equitable with respect to both present and future generations. It is possible only by holistically integrating environmental concerns into all stages of the developmental process. DSF therefore views any environment policy as an instrument towards achieving sustainable and equitable

development with particular emphasis on the interests of the poor and deprived sections of the society, especially those whose lives and livelihoods are inextricably dependent upon or linked with natural resource bases.

It is found that the members of DSF are ideologically close to the Left-wing in Indian politics, in particular the CPI (M). Though DSF is oriented toward the Left, it operates outside the platform of Left-wing politics. DSF believes that except the Left parties and groups, there is no real force in India at the moment which can claim to be genuinely concerned with the real question of the struggle of the Indian people. It has been observed from the opinions and perceptions. Of many DSF leaders and members who are CPI (M) members. Not only they are leftists but also modernists in their attitudes. It is no secret that CPI (M) personnel and resources are made available to the DSF and vice versa for the activities. The *People's Democracy*, weekly mouth piece of the CPI (M) provide wide and favourable coverage of DSF activities. DSF takes up S&T policy issues and provides factual inputs and arguments to the CPI (M) for formulating its policy stand points.

Both DSF and CPI (M) share the common ideology of popular mobilization on certain issues like education, health, and other social sectors for building popular struggles. The ideological similarity between CPI (M) and DSF and the extent of fraternal cooperation between them do raise certain legitimate concerns. Its ability to maintain a distinction between politics and party politics is often in question. If a S&T promotion organization enters the political fray often, as DSF does, observers would find it difficult to believe that it is a professional organization. Curbing the tendency to read political meaning into many major events and spending more energy investigating them carefully would help enhance DSF's credibility.

Objectives of DSF:

According to the constitution of DSF, the objectives of the forum is to provide a platform for discussion on, (i) social, economic and political implications of S&T policies, (ii) the problems of organization of scientific and technological institutions, and (iii) the role of S&T personnel in the development of the country. It further argues for (i) traditional/indigenous scientific and technological knowledge and achieving self-reliance, (ii) democratization of the work of scientific and technological institutions/organizations in the country to further the creativity of S&T personnel and people, (iii) promoting scientific temper amongst the masses, and (iv) promoting awareness amongst people about the implications of S&T policies for the society. It collaborates with other organizations both inside and outside the country with similar objectives to achieve its objectives (DSF sources).

Mobilizations; Campaigns and Strategies:

The technical dimension of DSF includes campaigns among working scientists, technologists, other professionals and academics on the one hand and campaigns among the general public, especially directly affected sections, for their empowerment and informed participation in decision-making by acquiring greater awareness of S&T issues. In order to do this, DSF employs various means of communication such as street plays, slide shows, exhibitions and workshops etc. The material produced for the communication addresses different target audiences, including policy-makers, activists, academics and general lay public. While the major content of this material is nationally coordinated, the same gets transcribed and produced at state/regional levels in local languages. The strategies of DSF are for creating material for campaigns on policies related to drug industry, health, the nuclear holocaust, the disaster like Bhopal gas leak and the WTO issues. Some of the specific and major

campaigns of DSF were the following: Against Indian Drug Policy (1984), Against Bhopal Gas Tragedy: industrial policy, health & safety (1985), Against New Seed Policy (1985), Against PepsiCo license in India (1986), Total Literacy in Delhi (with Delhi Literacy Society) (1991 - 1993), Health for all and IPR-related Issues (1995), Against Enron's Dabhol Power Project (1997), Against Privatization of Power (1997), Against Privatization of Telecom (1998), WTO-related Issues (2000), *Jatha* for Peace & Sovereignty (with AIPSN) (2003), Use of primates in scientific research: investigation into NII Primate House and CPCSEA allegations (2003), Against Privatization of Water Utilities (2004) etc. Of late the DSF has developed newer areas of research and activities. The more recent areas of interest for DSF have been MNC monitoring in India, Disinvestment in Indian corporate sector (public), R&D in drugs and pharmaceuticals, WTO, IPR (patents wars in India), Mega-power projects, Indo-US nuclear cooperation for power generation, Telecommunication policy (BSNL), and Climate Change related policy.

Intellectual Resources

Publications and conferences/seminars organized:

The 'Conscience Constituents', and protagonists of DSF on S&T policy are Prabir Purkayastha, Amit Sengupta and D Raghunandan. Research and Publication is the major work of DSF which brings out the critical studies of S&T policy related issues. Here DSF plays a leading role because its distinctive leadership lays in publications on several policy issues involving S&T. For DSF, 'a good state policy can do more good than many hundreds of NGOs working in small pockets, a bad state policy can do a lot of harm and undo the gains from several years of efforts'. Therefore, there is a need to understand policy inadequacies and pose alternatives. Developing well-studied and detailed critiques of developmental policies is essential for empowering people's organizations to seek participation/consultation in the decision-making process. S&T policies have social, economic and political implications on the people. Publications of DSF's policy work fall in the areas of; (i) nuclear disarmament, (ii) IPRs and patent laws (iii) health policy and policies on pharmaceuticals, (iv) educational policies, (v) energy and environment policies, (vi) sectoral policies — telecom, power, R&D, (vii) Panchayats and decentralization policies. That apart DSF has organized large number of seminars/conferences to pursue its agenda. Some of these were: Import of Technology & Impact on Development (1978), India and the International Drinking Water Supply & Sanitation Decade (1981), Indian Pharmaceuticals Policy (1986), Scientific Temper Workshop (1986), J. D. Bernal Centenary Seminar (1989), Sovereignty & Self-Reliance (1991), Development, Equity & Globalization (1996), Present Trends & Prospects of Drug Industry in India (1998), Technological & Scientific Self-Reliance (1999), Science & its Public knowledge, movements and images (1999), "Endless river": Joseph Needham Centenary Seminar with National Institute for Science Technology and Development Studies (NISTADS) (1997), International Patent Regimes (2001), Towards a New Indian Climate policy (with TISS Bombay) in Sept. 2009, public meet 'Against Corruption and corporate loot' 2th July 2011 (with PRAGOTI) etc. Although a small PSMO and with limited physical resources, DSF has initiated many valuable debates of national importance in India. While doing so it truly reflects its commitment to left wing thinking, as it has opposed India's reforms in (privatization of) telecommunication sector, reforms in (privatization of) the power sector etc.

Case Study. 5: *Eklavya*, A Pedagogic PSM Organization

The context of study:

The beginning of 1960s was a turning point in the arena of science education in India. It was then that University Grants Commission (UGC) of India and newly established National Council for Educational Research and Training (NCERT) started revamping science education in a big way. Many summer programmes with British and American consultants were organized, with the purpose of keeping teachers at all levels aware of recent developments in science. The enthusiasm exhibited through these programmes went a long way in innovating science teaching and in preparing for textual materials etc. National Council of Science Education (NCSE) sprang into existence, and it helped in many ways, to boost up science education through study tours, study group projects, support for journals in science education etc. The Education Commission, a massive effort since independence, was the first of its kind; to put it succinctly that science education has to be strengthened so as to make it an effective instrument for national development. UGC started with a great vigor its own programmes for improvement at the college level on science education.

In India, at the school level, because of a national pattern of 10+2+3, science has come to be included as a compulsory part of education upto Xth class. Even though not compulsory, science education constitutes the bulk of higher echelons of education. But one can hardly deny the existence of non-governmental science agencies which are engaged in the spread of science literacy at the school level. A significant lead taken, by a PSMO named *Eklavya*, a few decades ago concerns science education even today. The outcome of this development came to be known as the Hoshangabad Science Teaching Programme (HSTP). It further became the basis of formation of *Eklavya* (located in Central Indian state of Madhya Pradesh at Bhopal) a Non Governmental Organization (NGO). Except *Eklavya* (and to a limited extent KSSP & TNSF), no other PSM organization has been involved in rewriting the syllabus and training the teachers to transact it, that too in government schools. Hence it becomes an obvious choice for our case study. The following section outlines *Eklavya*'s formation as a PSMO and its radical large-scale intervention in the state-run middle schools of Madhya Pradesh.

Early Intellectual mobilization of the Movement

Many of the PSM organizations adopt slogans such as “science for peace”, “science to eradicate diseases”, and “science to counter exploitation”, which are contextualized through street theatre, plays, art forms and songs as a part of the ideological orientation of “science for social transformation”. The earliest point of reference of this case study can be traced back to the HSTP, an innovative effort to use experimentation as the primary pedagogic tool in science teaching. HSTP¹⁴ was initiated in the year 1972 in the schools of Hoshangabad district of Madhya Pradesh. It was operating in the field at a macro-scale level over a thousand schools and more than two thousand teachers. It stemmed from dissatisfaction with the existing mainstream practice of science education and continued for over thirty

¹⁴ It is also locally known as *Hovishika* (from the corresponding acronym in Hindi) or Hoshangabad *Vigyan* or Rasulia *Vigyan* (*Vigyan* in Hindi means Science).

years. Its entire dynamic was affected through the confrontation or through the dealings with the mainstream of science education by providing a space for an alternative conception of science education. First, the entire conception of the programme was influenced by the larger trends in thinking about science education. Second, it was an attempt to reinterpret those ideas in the Indian context and also engage with the mainstream school system to evolve workable models of practice. These two factors in addition to the larger ideas enable us to understand the existence of the programme over thirty years.

The dismal pictures of science teaching in the mainstream schools brought the context of reforming school science teaching. It was mainly textbook-based rote learning with little emphasis on understanding concepts or the process of science which was contested. There was even a tendency to introduce advanced abstract concepts in a compact manner, without sufficient preparation or adequate elaboration of the subject. Conciseness and brevity couched in scientific terminology was confused with simplicity of presentation. It was dominated by the teacher-to-student 'chalk and talk' method with virtually no scope for experimentation, hands-on-experience, exploration or discussion. Textbooks have tended to become content heavy, with no scope for relating to the local environment and local issues. Examinations and tests consist largely of questions aimed at information recall, which reinforces rote learning. The organic link among discovery, experiment, hypothesis, theory and knowledge in science is totally ignored, with theoretical descriptive texts narrating concepts with little light thrown on how they were discovered. Thus learning science becomes drudgery devoid of perceivable meaning for students. It leads to loss of interest and students are totally deprived of the excitement and sense of wonder that science arouses.

It was believed that good and effective training during the early years in the method of science would help children develop their inherent analytical powers, their ability to formulate and observe problems, make logical analysis and draw conclusions from their experiences (Ganguli, 1976; Eklavya, 2005). It was further argued that the valid science teaching in a village must necessarily involve interacting with the whole life pattern of people living therein. Thus school science teaching could provide an effective channel for work in areas like agricultural productivity, development of local intermediate technologies and in areas of health and family welfare. It could also influence social attitudes, enabling children to begin questioning the traditional structure around them.

PSMs drew attention to the need to connect education with their struggles. For instance, Gandhi's vision of decolonization was linked to an alternative vision of education. Tagore's vision of education was related to a cosmopolitan ideal that went beyond narcissistic nationalism. Freire envisaged dialogic education as a means to create an egalitarian society. He advocated daily, continuous innovation in the classroom. He suggested that teachers move beyond the text to enable the child question its sanctity. Teachers should be empowered to develop a symbiotic, dialogic relationship with students, instead of the mindless brutality of most classroom situations. Learning can be a joyful, aesthetic experience instead of a source of oppression.

It was argued that HSTP for the first time used a universally acknowledged pedagogical approach to the teaching of science. Essentially, the pedagogy was based on 'learning by doing' emphasized on the process of science leads to discovery, and critical thinking. This practice replaced textbooks full of information with workbooks facilitated actual experimentation by children, and helped them to deduce inferences. The objectives of HSTP was to help improve the quality of science teaching in middle school (classes VI to VIII)

within the existing government school system, and within the mainstream syllabus, based on the principles of 'learning through activity' in contrast to the prevailing textbook-centred 'learning by cramming up/rote learning'. This innovative pedagogic approach used experiments performed in the classroom by the students to learn through observation and discussion, i. e. executes the 'method of science' in the classroom.

Both the contexts and the issues of pedagogy motivated HSTP and mobilized participating groups and organizations. HSTP was an outgrowth of two voluntary rural development organizations; Friends Rural Centre (FRC) and the *Kishore Bharati* (KB). The two organizations looked upon an inquiry-oriented environment-based science teaching in schools as an important input for social, economic and cultural transformation in rural areas. FRC was a Gandhian institution established under the direction of Sudarshan Kapur and the KB was founded by Anil Sadgopal; a Caltech trained molecular biologist. Sadgopal was aware of the then efforts of Doon School¹⁵ teachers, who had started a Physics teaching programme based on experiments. It was inducted into four middle schools run by the Bombay Municipal Corporation (BMC), but didn't sustain due to the traditional examination system. Sadgopal contacted these two Doon School teachers (B. G. Pitre and Chandra Kant Dikshit) along with two professors (viz. Prof. Yash Pal and Prof. V. G. Kulkarni) of the TIFR, who had supported the Bombay experiments and discussed the idea of a new experimentation in rural schools of Hoshangabad district (Masih, 1998: 31–32). Though none of the people in FRC and KB had formal training in education methods, but both FRC and KB consulted and received the assistance of the All India Science Teachers' Association (AISTA) and scientists from TIFR (Mukund, 1988: 2147). These initial efforts by FRC and KB made HSTP possible and thus HSTP began as a grassroots science curriculum reform initiative on an experimental basis and the state government permitted the two agencies to conduct their teaching experiment in 16 rural middle schools in Hoshangabad district.

In July 1978, HSTP got a boost when the Department of Education of Madhya Pradesh Government decided to extend the programme in all the middle schools of Hoshangabad district and also took the responsibility of running it. Since the programme needed an autonomous organization to serve as a nodal agency and to develop the curriculum, Eklavya¹⁶ was formed in 1982. With the formation of Eklavya, the responsibility of consolidation and expansion of HSTP was taken up by this organization with the help and collaboration of KB and other resource groups. Eklavya has organized science and literacy programmes on a state wide basis. However, Eklavya's main focus has been in the rural regions of the Madhya Pradesh. Eklavya has placed particular emphasis on the development and use of science kits, tools, equipment and methodologies for teaching science as a part of the literacy programme.

¹⁵ Founded by Satish Chandra Das in 1935, the school was based on an adaptation of the English public school system on India's tradition-enriched soil.

¹⁶ The organization takes inspiration from the story of Eklavya in Mahabharat. The story of Eklavya from the Indian epic, Mahabharat, illustrates the association between education and elites. In this story, a tribal boy is openly denied the opportunity to learn archery from a famous teacher who was appointed to train the local princes. Refusing to be discouraged, the tribal boy attains mastery by self-practice, in the symbolic presence of a clay idol of the famous teacher. When this surreptitious-training was found out one day, the teacher asks the boy to cut off his right thumb and give it as a ritual gift. This way, the teacher reinstates the social order which allowed only the royal sons to receive archery instruction of the highest quality. This story inspires the organization to bring the best in education within the reach of everyone; to support each one's effort to learn and discover, question and create.

Later Intellectual mobilizations

Role of Intellectuals and Wider Circles:

For sustained and meaningful change, intellectuals have to reconstruct the way they see the world. This means that groups of intellectuals need to become agents of change by reflecting on everyday activities and by acting to resolve the tensions and ambiguities that confront them in their daily lives (Freire and Shor, 1987). The intellectual underpinnings of Eklavya often came from those two action oriented research groups, namely, Friends Rural Centre and Kishore Bharati and partly from the emerging community of teachers and scientists. To Eklavya, intellectuals came from elite institutions such as Tata Institute of Fundamental Research (TIFR), Indian Institutes of Technology (IITs), Delhi University (DU), Centre for Cellular and Molecular Biology (CCMB) and National Institute of Immunology (NII). Later, the involvement of other college and university professionals was facilitated through a formal intervention of the UGC. Consequently, a score of science professionals was seen at *shivirs* and in schools in remote areas of the district, rubbing shoulders with village teachers to create an activity, discovery and environment-based methodology for science teaching.

Intellectuals like Anil Sadgopal, Sudarshan Kapur, Sadhna Saxena, Kamal Mahendroo, Vinod Raina, C. N. Subramaniam, R. N. Shyag, Arvind K Gupta and Anwar Jaffrey, the 'Conscience Constitutents' (McCarthy and Zald, 1977) of this PSMO have shaped and reshaped itself in different ways. They formed Eklavya to launch innovative programmes attempting to connect S&T capacities with the aspirations and competences of communities in rural and semi-urban areas and communities. They further realized that these communities either by design or by sheer negligence have been left out of the benefits accrued out of modern science and its applications. Yet, they acted as resource persons of Eklavya and were actively involved in its activities and programmes although in varying degrees. They believed that education does not occur in isolation from society and environment. Rather education can help to build a scientific-historical understanding of the structure of society and its development.

Anil Sadgopal was the prime mover of this experimental science education project in India which later on took the shape of Eklavya. He worked at the TIFR, in Mumbai for some years and moved to Madhya Pradesh in the early 1970s to address the nitty-gritty of development. Sadgopal's sense of what is possible and what is problematic in Indian context stems from his experiments with the low-cost, high-intensity HSTP. Along with Sudarshan Kapur, Sadhna Saxena and Kamal Mahendroo, he persuaded scientists at the TIFR and professors at the premier IITs to come to Madhya Pradesh villages and towns. During the early 1970s and 1980s, they sat with personnel from the Regional Colleges of Education, the NCERT and government middle school teachers of Madhya Pradesh to find new ways of teaching science. He was influenced by Gandhi's idea of unifying the world of work and the world of knowledge. Sadgopal and his associates pushed towards decentralization of the curriculum, drawing directly upon the local environment, and persuading teachers to tap into the experiences of the community. From the teaching of science, HSTP expanded into social teaching and in the process, languages teaching began to be looked at in a more creative way. The Hindi language, for instance, grew leaps and bounds as HSTP recorded and amplified the work experience of whole villages, linked it with formal scientific theories, and coming up with new teaching ideas and teaching aids, and more constructive approaches to problems of discipline, monitoring

and evaluation. Sadgopal places school at the very centre of society. He envisaged a common school system — the *Lokshala* (People's School) — funded by the State, with each local community at the administrative block level running its own complex of elementary and high schools within a guaranteed framework of equal rights for all children.

For Eklavya, pedagogical innovations that take the local context into account and the popularization of science and its method to make people understand the local socio-political situation as a part of PSM are important vehicles for empowering people and building countervailing forces against the hegemony of modern S&T systems. Vinod Raina, a founding member of Eklavya, stresses that counter-hegemonic is already implied while seeking alternatives to the status quo in areas such as S&T, pedagogy and culture. As a theoretical physicist, Raina resigned from his job in DU in 1982 to devote full time to grassroots science initiatives, i. e. initiating a PSM activities with a nuance in India. He had been advocating alternative school curriculum for rural areas for almost two decades. In the context of localization of syllabus and science teaching of Eklavya, Raina quoted examples of how language plays an important part in children's success in science education. Often, the children have a very clear understanding of scientific concepts, but the terminology used by them in local dialects differs with the standardized requirement of centralized textbooks. The differences in language and terminology is often mistaken as ignorance and needed to be handled with understanding and sensitivity to local conditions. He further argued that the state is inevitably the only prime-mover in the field of science education due to the scale of institutional structure, activities and funding required for the vast numbers of India's children. While voluntary organizations and NGOs cannot match the impact of the state in providing accessibility, however, organizations like Eklavya could carry out the important task of inventing and experimenting with new ideas and strategies in education, which the state can then be convinced to adopt.

R. N. Shyag, a core activist of Eklavya, had a specialization in microteaching and completed his Ph.D. at Punjab University. To him, micro-teaching is a training technique for teachers which simplify the complex tasks. He joined Eklavya in August, 1983. Since then he has been working with Eklavya as a key resource person. Shyag emphasised upon Activity-based science Teaching programme, ASTP in Eklavya. He believes that since ASTP is an experimental-learning, it is useful for small classrooms, primary and upper primary schools. He says “education is common and acceptable to all. There is no direct contradiction or confrontation involved and it is an entry point for working with people.”

The widespread view that Eklavya is a ‘leftist’ organization arises from several facts and perceptions. Many Eklavya leaders hold partisanship in left-wing political parties like CPM (Marxist-Communist Part of India). The identity of Eklavya as a leftist organization is neither new nor false, although every attempt has been made, especially in the recent past to disown this identity and to keep Eklavya's public discourse purely academic. Shyag says that ‘working on education enables them to be engaged in some radical agenda. If they talk about minimum wage, they cannot mobilize many people. Moreover, one would face off opposition’. Rather education is common and acceptable to all. There is no direct confrontation involved and it is an entry point for working with people. In essence, educational work does not require the backing of a large political party.

Organizational Resources

Eklavya as a Social Movement Organization

The formation of Eklavya can be seen as a new social movement by sharing some of the features of NSMs: (1) Multiple actors like students, intellectuals and activists played significant roles in the formation and functioning of Eklavya. Those who led the movement were of course intellectuals. The composition of these intellectuals was that it was drawn from middle class background. It is the intellectuals with a middle class origin that made Eklavya proliferate. (2) These intellectuals tried to bring about the changes through different means such as scholastic writings, mobilizing public in a methodical/strategic manner, using media favouritism. (3) The structure of the organization was compact, it was not hierarchical in functioning. (4) Eklavya worked on diverse issues such as innovation in science teaching, promotion of scientific knowledge among the common people, opposition to big developmental projects of global corporations and World Bank, researches related to natural resources and health care. (5) Eklavya has been engaged with various like-minded civil society groups like *Digantar Sambhav*, *Srujanika*, *Vidya Bhawan Society* etc to help them in designing curricula, training teachers and other educational activities. Such collaborations helped Eklavya to disseminate its ideas about education and its innovative work in curriculum development and teachers' training. (6) Eklavya did not work with any political ambitions and political goals. Rather, its goal was to bring a novel science teaching method at the school level by introducing alternative pedagogy. (7) It used science in Freirian notion of 'literacy', began to mobilize the extensive network of teachers and children, who, if meaningfully motivated, can act as potential agents of social change (Rampal, 1992: 70). (8) It is a social movement organization which began as a programme and later on started taking up the issues like education, health, environment, ecology, sustainable development, *panchayati raj*, community development programme etc.

Eklavya is staffed with more than 100 full-time members. It has a three-tier organizational structure consists of Governing Body (GB), Academic Council (AC), Coordination Centres (CC) and Field Centres (FC). The GB was the supreme body of the Eklavya organization which elects the chairperson, secretary, and treasurer. It must hold at least two meetings every year, with half of its members continuing a quorum. It has a membership not exceeding 15 persons and not less than five persons at any given time. Of these members two are nominated in rotation by the AC for a period of two years from among the faculty members of the organization, while the Eklavya director is an ex-officio member. All members have tenure of five years. The AC meets, once in two months. The AC is further divided into the Academic Body (AB) and Executive Body (EB). The former looks after the administration cum academic matters and the latter holds the management side of the organization. FC is a catalytic unit for initiating, testing and diffusing innovative ideas in both formal and non-formal education. The location of the FC maintains a close proximity to a large number of village schools. Each FC has a few resource persons and is expected to involve local manpower and resources. Eklavya has four each FCs and sub-FCs in Madhya Pradesh. The job of coordinating the FCs has been entrusted to a CC and the office of the administrative coordination centre is located in Bhopal city.

Aims and Objectives of Eklavya

According to its constitution, the aims and objectives of Eklavya are to:

- evolve and implement an educational system for social change and general upliftment of Indian society;

- evolve an educational methodology and curriculum for building up a scientific-historical understanding of the structure of society and its development;
- develop problem-solving skills, the spirit of inquiry and scientific temper in society;
- explore new directions in both formal and non-formal education for all sections of the society, including children, youth and adults;
- conduct research into the environmental problems of different regions with a view to developing awareness of the need for conservation and scientific management of natural resources;
- conduct research into the factors which prevent the growth of scientific temper as well as into the mechanisms for spreading scientific outlook in society;
- conduct research in agriculture, forestry, technology, health care and social welfare with a view to relate education with employment potential, the nature of production and the needs of deprived sections of society;
- conduct research in both formal and non-formal education and in all branches of social sciences, pure sciences, languages and communication;
- conduct research in literature, fine arts and cultural traditions of different regions in order to enrich the educational curriculum;
- prepare a historical review and critique on Indian education;
- train educational and research personnel;
- conduct field-level testing of innovative ideas in education;
- identify and utilise various mechanisms and structures, Government or voluntary, and to create structures for the diffusion, expansion and multiplication of educational innovations;
- establish and maintain libraries, information services, museums, workshops and laboratories;
- organize seminars, symposia, discussions, lecture demonstrations, youth camps, exhibitions and other such activities;
- collaborate with other institutions and individuals, including youth centres, voluntary groups and trade unions, in pursuance of the above objectives and finally;
- promote and organize institutions/field level centres/branches/sub-office wether independently or in collaboration with the government, wherever and whenever necessary, for undertaking work in fulfilment of the above objectives (Eklavya Sources).

Financial Resources: The Funding Streams

The major funding of Eklavya came through DST, Government of India and State Government of Madhya Pradesh. It receives funding from various governmental organizations such as Ministry of Human Resources and Development (MHRD), NCSTC, UGC, CSIR, Indian Council of Social Science Research (ICSSR), Indian Council of Historical Research (ICHR), NCERT etc. In the recent years, Madhya Pradesh Council of Science and Technology (MPCOST) started funding for various projects to Eklavya. In the year 1995–1996 the funding of Eklavya from all Govt. sources was to the tune of Rs. 5,450,000/ and by the year 1997–1998 it moved to the tune of Rs. 7,658,000/. In addition to these in the year 1995–1996 and 1997–1998 the incomes of Eklavya from different sources like sale of publications, donations etc amounted to Rs. 1,120,000/ and Rs. 822,000/ respectively

(Eklavya — A Profile , 1999; and Eklavya Annual Reports, 2004). The activities of Eklavya became so vibrant that by the year 2003–2004, its income from publications, donations etc, reached a hopping amount of Rs. 10,863,000/ (A three year report of Eklavya, 2001–2004).

The charitable trusts of corporate houses like Sir Ratan Tata Trust (SRTT) and Sir Dorabji Tata Trust (SDTT) provided support of which Eklavya built a corpus fund. In 2001, major software firms like Wipro through their corporate social responsibility (CSR) activities, provided funding, research and development, experiments to bring out educational reform in schools. Eklavya along with support from WATIS¹⁷ is running whole school transformation programme in schools of districts. Another major source of funding is through the sale of publications & scientific toys. A few minor sources of income were membership fees and voluntary donations. It is a matter of policy and principle that Eklavya refrains from accepting from foreign institutional contributions.

Human Resources

The most predominant group among its members is of teachers. In addition to a large number of teachers, the other resource pool consists of actively involved scientists, social scientists, educationists and research students from institutions/universities of advanced research and higher education. A large group of scientists, and teachers from DU and a few, from IITs etc joined Eklavya. There were people on fellowships from colleges of Madhya Pradesh to participate in the science teaching programme on a regular basis. And much later, scientists from the prestigious R&D institutions like CCMB, NII and National Physical Laboratory (NPL) etc were also involved in Eklavya. This involvement shows that how a large number of academicians play instrumental role in the improvement of school science education at rural level. Eklavya classifies its members on the basis of their occupational careers such as teachers, students, scientists, social scientists, political activists, social activists etc. In Eklavya, around 35–40 % employees are women. Nonetheless it cannot be substantiated with empirical data, it seems that majority of the active members and leaders of Eklavya were from salaried middle class background.

External Linkages:

Liaison with other Civil society/Social movements and the State

Eklavya envisions the emergence of more people's movements against globalization and to do this, it participates in the World Social Forum (WSF) and Asian Social Forum (ASF). Specifically, the global WSF movement milieu is a network of networks, linking multiple social movements (Castells, 1996) constituting a movement of movements. As such, WSF movement explicitly and implicitly engages with the North-South issues. That

¹⁷ Wipro Applying Thought in Schools (WATIS), a WIPRO initiative to improve the quality of education partnering with social organizations, works with schools in all spaces, urban, semi-urban and rural. While the Azim Premji Foundation (APF), an implementing organization of WIPRO, partners with state governments working for government schools space. For more details see <http://www.wiproapplyingthoughtinschools.com>.

apart Eklavya showed its solidarity with *Narmada Bachao Andolan* (NBA), a loose confederation of groups from the country as the latter is against the anti-people development policies of the state. Eklavya supports the NBA from the vantage point of its environmental and development perspectives. The NBA has also been supported by the academic community. Eklavya has been associated with other PSM organizations like DSF, KSSP, MVP and *Madhya Pradesh Vigyan Sabha* etc. It was associated with KSSP in 1978 due to its common interest in the areas of education and development. As mentioned earlier Eklavya collaborates with various like-minded civil society groups like *Digantar Sambhav*, *Srujanika*, *Vidya Bhawan Society* etc for curricula designing and teachers' training etc.

Eklavya's networking efforts and alliances with other voluntary organizations, and Governmental programmes in other states (e. g. Bihar, Chhatisgarh and Delhi) as well as the NCERT has brought national credence to the organization. The Students' Educational and Cultural Movement of Ladakh, a strong local organization, sought resource support in preparing a set of textbooks in Science and Social Science and chapters in EVS. Eklavya participated in mobilizing a group of resource persons from outside Ladakh for a continuous period of about six months, involved local primary school teachers for feedback, illustrations and trial of chapters. Eklavya was involved with NCERT for developing the National Curriculum Framework (NCF) in 2005. It has been a forerunner in establishing an effective collaboration within the Government school system. It has created networks of trained Government teachers and developed systems for feedback and support at the field level so that teaching and learning processes can continuously evolve.

Intellectual Resources: Approach to Innovation in Science Education

Intellectual antecedent: Hoshangabad Science Teaching Programme (HSTP):

Prior to the formation of Eklavya, HSTP had begun in 1972 with the aim of bringing innovation in curriculum and pedagogical renewal for science teaching in Hoshangabad district of Madhya Pradesh. It had pioneered the concept of activity-based science teaching (AST) in 1978 which was *contextualized* science through local knowledge and use of local materials. Such kinds of innovations associated with child-centred education and social change was initiated outside the state-system and later demonstrated the need to work intensely with government school teachers through the curriculum and textbooks. Consequently, through the NCERT, the programme was extended to cover all the middle schools (around 220) of the Hoshangabad district in 1978. In 1982, Eklavya, was formed as an NGO with the support from the Government of Madhya Pradesh to carry forward the HSTP model to other districts of the state, and into other subjects and classes of the elementary school. By 2002, thirty years after its inception, the collaboration between the Government of Madhya Pradesh and HSTP-Eklavya had extended the science teaching programme to over 1,000 government schools in 15 districts across the Mahakaushal, Nimad and Malwa regions of Madhya Pradesh. Involving over 2,000 teachers, about 200 resource teachers and a number of resource persons drawn from leading research and higher education institutions in the country, it directly reaches out to over a hundred thousand children annually (HSTP Group, 2002). It had also established 1,500 rural science clubs in these 15 districts of Madhya Pradesh. It was then that the Government of Madhya Pradesh decided to call off the collaboration,

asking all its schools where HSTP was running to revert back to the state books and examinations, as in the long run the HSTP model of teaching did not bring any different result for those schools and for the recipients of this experimental science education.

The objective of HSTP was to help improve the quality of science teaching in middle school (classes VI to VIII) within the existent government school system, and within the mainstream syllabus, based on the principles of 'learning through activity' in contrast to the prevailing textbook-centred 'rote learning'. On the basis of objectives and perspectives of HSTP evolved from 1972 to closing down of HSTP in 2002, the thirty years of HSTP can be divided into four distinct phases (HSTP, 2002; Eklavya, 2005). The phase I (1972–1977) designed for science teaching for rural transformation had involved 16 schools of the rural areas in Hosangabad. The phase II (1977–1983) demonstrated the pilot phase of evolving a holistic science education in 16 schools. The objective of the second phase was to evolve systems for introducing innovations in school education at the district level. The phase III (1983–1990) forwarded the objective of the second phase of creating and disseminating the system from micro-level experiments to macro-level. The phase IV (1990–2002) focused social validation of HSTP approach through evaluations and public advocacy. Public advocacy was needed to improve the HSTP approach through press and other media as well as by organizing interactions at various public spheres.

It was a remarkable fact in the Indian social context that scientists and other academics from the elite institutions in the country went into the countryside and taught science at the village level. One could be impressed by this display of idealism among these academics. The government also supported the effort. Why then did the effort fail (as HSTP was forced by the then MP government to close down in 2002)? Firstly, since periodic scientific evaluations of the HSTP pedagogy were not carried out which could have suggested that the programme was running amateurishly and relied too much on the subjective judgements of the participants? Secondly, the programme was not running in the state as a whole. It was taught only in 560 schools but not to all the schools in the state. In this context, an active member of Eklavya said that as far as up-scaling HSTP to the entire State and other states are concerned, was purely a political decision. He further opines that the then bureaucratic personnel failed to find the significance of HSTP. It was also argued that the concentration of HSTP confined to the districts having huge tribal populations. Thirdly, members of Eklavya drop dark hints that the closure of the HSTP was the result of a plot by right-wing parties. If so, then at the time the programme was discontinued, there was a non-right wing party, i. e. Congress government in power in Madhya Pradesh. Why should they have succumbed to right-wing pressure, if they felt the programme was doing something useful? Fourthly, the programme totally dissociated from needs of the local people. It was a programme where a bunch of elite people (those closest to the former colonial masters and product of western education as well) descended on the villages to teach economically insecure people about lofty things like "scientific temper", when what the natives/localites expected from education, was a job or at least improved practical skills to survive off monsoon-driven agriculture of the rural economy, and to negotiate with the local government. Finally, HSTP demonstrated the possibility of innovation in government educational structures, and the public-private partnership (PPP) is one way of implementing changes that neither might achieve on its own. This innovation phase was the preoccupation of many Gandhians and scientists working on science education and technologies at TIFR, IITs, DU, and other Indian universities. It had, however, set the tone for an alternative discourse and fostered a climate of debate on science education that addresses the relationship between child, teacher, classroom and learning.

Eklavya's Innovative Approach:

Eklavya's approach to innovation in school science education can be seen through *curriculum development*, *teachers' training* and *school development*. The curriculum development is made through a participative and collaborative process involving subject experts, teachers, researchers, field level workers, designers, artists etc. They usually begin by developing a critique on the existing curricula and consequently, an alternative framework gets formulated. This is largely based on accepted principles and objectives of education. It is also informed by latest research on the learning process and the subject area. These innovations are first field tested at a micro-level in a few selected schools and later expanded to more schools and other regions. Along with text-books and work-books, kits and other teaching-learning materials were designed for children. With an attempt to structure the content of the courses around the environment and life of the students, the activities relied heavily on use of locally available materials and take care of factors like cost reduction and procurability. For example, Eklavya science teachers identified *Babool ka Kanta* (thorn of Babool) available locally in the regions of Madhya Pradesh as an instrument for puncturing and dissection and included it in a science kit they developed for biology students. They further developed an inexpensive way to explain basic machines. This involved using spent ball-pen refills, flattened paper clips as "axles" and ordinary buttons sealed back to back under candle flame to provide multipurpose wheels and pulleys. The standard curricula for middle schools, as found in the science literacy maps, follow a strong "bottom up" approach. Concepts are introduced often at very early stages, such as in the first or second grade and then developed by revisiting the same in greater depth in the upper grades. Connections between topics are also exposed through this development process. This approach is obviously effective as it follows for the time taken to absorb and develop each topic.

For, Eklavya, the teacher is the pivot in which innovative educational changes in schools hinge. Hence, teachers' motivation and orientation were the most important inputs in any process of educational changes. To do this, Eklavya devised appropriate re-orientation and training programmes for the teachers in the methodology and content of the new curriculum. To ensure further back-up at the classroom level, a system of regular visits to every school by resource persons had been set in place. Such visits were also a major source for feedback on the curricular package, an essential input for further improvement. Teachers met once every month to discuss and sort out their classroom problems. These meetings also provide a forum for continuous training and feedback collection. Thus, increased peer group interaction and improvement in their subject knowledge base as well as their understanding of educational philosophy, helps improve the self-image and self-esteem of teachers. By contributing to all aspects of innovation, from text-book to educational administration, teachers become the authors and owners of these innovative practices. Eklavya evolves teacher training techniques that transform the teachers from fountainheads of knowledge to facilitators.

School development means looking at change holistically and approaching the problem from all fronts simultaneously, e. g. if the science teacher introduces experiment-based learning and a questioning attitude in children, the language teacher complains of indiscipline in classroom, of students being unruly and noisy. Students who move freely in a social science classroom, working in groups and interacting freely with the teacher feel stifled in the mathematics classroom. Hence, the evaluation methods and examination system have been designed according to the learning objectives as they tend to become major determining factors of classroom practice. Eklavya has developed alternative systems of open-book, written as well as practical examinations.

Activity Types and Audience Reach

Since its inception, Eklavya's PSM activities aimed at community involvement. It has been undertaking a wide-range of activities like teaching programmes, popular lectures, the joy of learning campaign, posters and street plays, *jathas* on specific issues (e. g. Bhopal gas tragedy, health and medicine, literacy, women's equality, rural technology etc), and publications for promoting scientific literature. The target audience of these activities has been adults, especially middle-class youth.

Primary Education Programme: This programme began with the growing realization that a proper grounding of children at the primary level enhances the quality of learning in middle classes. The primary education programme (PEP) of Eklavya is popularly known as *Prashika*, an acronym stands for *Prāthamik Shikshā Kāryakram*. The programme was rooted in the initial discussions of HSTP members and students of the Department of Linguistics in the University of Delhi in 1983. *Prashika*, an experiment in making primary school education a joyful one, was started in 1987. The underlying premise was that the unfriendly and unattractive package of education offered to poor rural children was responsible for the low levels of enrolment and high rates drop-out. Hence, in 1987 a book of ideas entitled *Khushi Khushi* (Happy Happy) was put together along with a guide to the teacher as to how to use it. The programme demonstrated how primary school children in rural India can be made to feel that their school has a utilitarian function. The experience of PEP contributed to the design of a formal school programme called *Seekhna-Sikhana* (Learning-Teaching) developed under the aegis of the Madhya Pradesh State Council of Educational Research and Training (SCERT), with Eklavya's active collaboration. This programme now covers almost 80,000 primary schools in the state.

Forums and Popular Lectures: In the last 25 years of Eklavya, over 300 discussions and lectures have been organized on topics such as, 'what is a comet', 'Darwin's theory of evolution', 'the world of the blind', 'the forest policy', 'role of women in social change', 'Narmada Sagar dam project' etc. These lectures provided various critical discourses, talk about what they think and understand each other's viewpoints. The observation of science lectures and science classes at schools revealed that the students were imparted knowledge of science in their mother tongue. The students were provided opportunities to make themselves acquainted with scientific knowledge in their native language which might not otherwise be available to them. Active interaction between the resource persons who presented the programmes and the participants were also observed. Eklavya established a discussion forum called *Ambedkar Vichar Manch*, (Ambedkar Discussion Forum) in collaboration with Dr Babasaheb Ambedkar National Institute of Social Sciences, Mhow, MP.

The Joy of Learning Campaign: The joy of learning (JOL) is a means of developing interest in children towards education in general and science in particular. The JOL was designed in such a way that the main thrust goes to children of two age groups from 6–7 years and 12–14 years. The programme was consisting of a series of children science festivals (CSFs) at village, block and district levels. The JOL festival at national level was organized in October–November 1994 by BGVS along with Eklavya. It was attended by 1,000 children (500 host children from Delhi and 500 guest children from other parts of the country), 300 resource persons. Students visited important S&T institutions, Nehru Planetarium, National Museum, and Rail Museum etc as part of the science tours organized under the programme. The science tours formed an integral part of the JOL festival. The basic objective of the

tour was to promote the observation skills of the children and to expose them to actual life situation. More than 30 scientists from different scientific institutions conducted interactive sessions on various science related topics. A second round of JOL programmes were undertaken between August-October 1995 on the theme of Total Solar Eclipse. Themes like 'sky Watching' and 'Eclipse Watch' were added to the regular JOL programmes later on. Based on past experiences, Eklavya undertook the preparation of materials on science education and low cost experiments for JOL. Science teaching through simple experiments, teaching social science through interesting activities, mathematics learning through games and puppetry, creating works of art from waste material etc was the foci of these trainings.

Posters and Street Plays: Eklavya uses posters to inform the people through a media-controlled, unified language of objects that recognizes the meanings and affiliations associated with the contents of these posters. Posters have been developed on issues like 'Bhopal gas tragedy', 'what are miracles', 'people's health and medicine', 'literacy, women's equality', 'Narmada dams' etc. These are mobile programmes going from one village to another, often on cycles. An audio-visual workshop was organized at Bhopal during 6–12 April, 1984 to evaluate the relative effectiveness of such medium. The workshop was based on the theme of 'Evolution of Machines' and supported by the MPCOST and Department of Teaching Aids, GoI. During the workshop, it is understood that scientific principles of machines are adequately dealt with various levels in many existing books and films. Scientific principles of machines per se are of interest only to a very specific category of people, e. g. science teachers, professionals, students. The objectives of the audio-visual workshop were thus formulated to raise pertinent questions regarding the role of technology in society. Eklavya also uses the mode of street play to communicate scientific messages. In street-plays several artists performed on the issue of drug addiction and alcoholism, girl-child education, ecology and environmental pollution, child labour, developmental issues, exploitation of consumer market by MNCs, consumer protection, female foeticide, national integration and illiteracy etc.

Publication and Promotion of Science Literature: The objective of the publication programme of Eklavya is to generate and promote science and educational publications in local languages. Emphasis on the local language is the major reason for its success in drawing support from the local people in the region of Madhya Pradesh. Eklavya provides the reasons for publishing books and magazines in local language, i. e. Hindi. First, the market publishes books in English languages and there is a shortage of books published in local language. Second, as the local language of Madhya Pradesh is Hindi, publishing books in Hindi can be easily grasped by the readers. Third, it publishes the books and magazines for school going children, in particular, for rural as well as urban poor children. Finally, Eklavya understood that it would be rather difficult to translate from Hindi to English due to the developmental problem of the context.

The publication activity of Eklavya started with *Hoshangabad Vigyan*, a quarterly science magazine for teachers, parents, educationists and people associated with different programmes of Eklavya. *Chakmak*, a monthly science magazine for children was launched in 1985 to reduce the dearth of good reading material available to children, especially in rural areas. The role of *Chakmak* in science education is to inculcate scientific temper among children. In the 2000, the publication of *Chakmak* had a print order of just 3,000 copies per month and a tense debate was on at the editorial office over its fate. In its heydays, *Chakmak* had a print order of 50,000 copies as the Madhya Pradesh Government brought them

for distribution in schools. Sushil Shukla of Eklavya believes *Chakmak* is different from others of the genre in that it has a bit of science and other details apart from the ‘once upon a time’ tales. At the Bhopal office, Sushil Shukla was not also sure if advertisements from foreign companies should be accepted as he believes the editorial contents could get affected. It need not be so but then he is not convinced though one cannot agree with him. Apparently, Eklavya is averse to diluting the pristine purity of its ideological commitment even if it means suspending printing of *Chakmak*. Eklavya’s *Srote*, a weekly science news feature service has been catering to newspapers, radio and television. *Sandarbh*, a bi-monthly on education and science magazine helps to widen science teacher’s understanding of the subject. The following Table provides information about the number of titles published and the print run of these titles from 1993–1994 and 2003–2004.

Table 1

Showing print run of Eklavya Textbooks during 1993–2004

Year	Titles	Copies Printed
1993–1994	4	25,000
1995–1996	15	35,000
1996–1997	5	22,000
1997–1998*	24	91,000
1999–2000*	15	112,000
2000–2001*	14	144,000
2001–2002***	34	171,000
2002–2003**	60	228,600
2003–2004*	35	71,000

Source: *Eklavya Annual Reports 1993–2004*.

* Includes new titles and reprints of the title publications.

** Includes new titles, reprints of the title publications and textbook reprints.

*** Includes new titles, colour titles, reprints of the title publications and textbook reprints.

Eklavya’s publications emerged from the field experiences in different programmes, or have been tried out in the field independently. The publication efforts of Eklavya are essentially for the promotion of readership of progressive and scientific literature. Books were mainly marketed through PITARA, a storehouse of over 1,500 innovative educational resources from all over India opened in the year 2000.

Kabir Bhajan Mandalis Programme: In the year 1993–1994, there was a shift in PSM activities by Eklavya. Firstly, Eklavya initiated activities with strata of population hitherto untouched by them, i. e. illiterate agricultural workers etc this was done through *Kabir Bhajan Mandalis* (Kabir Devotional Songs Circle), a very old network of traditional *Bhajan* (devotional) singers in Malwa region of Madhya Pradesh. The simple yet scientific thought behind all *Kabir Bhajan Mandalis* programme explored the oral tradition and Kabir’s¹⁸ verses that existed

¹⁸ Kabir, a Bhakti saint, ranks among the world’s greatest poets. Back home in India, he is perhaps the most quoted author. The Holy Guru Granth Sahib contains over 500 verses by Kabir. The Sikh community in particular and others, who follow the Holy Granth, hold Kabir in the same reverence

in the Malwa region of Madhya Pradesh. This programme created a sense of unity in diversity, an integral part of Indian culture. People, both artistes and listeners, got a chance to come together under one umbrella and exchange ideas, perform, watch performances as per their own needs and liking. Gradually it took an organized character and turned into *Kabir Bhajan Evam Vichar Manch* (Kabir Bhajan and Discussion Forum). Most of the *Kabir Bhajan* groups consist of people from Scheduled Castes (SCs), very lowly placed in the social hierarchy.

Over a period of time, Eklavya kept in touch with these groups and established a dialogue with them explaining their mission and objectives. Eklavya believes that the underprivileged and *dalit* sections of society are completely engrossed in their daily lives and in meeting their basic needs. Eklavya further argues that unless they are involved with the programme at intrinsic level, the programme can not achieve any meaningful success. In a sense, there was popularization of the radical and highly secular thoughts of Kabir. Eklavya examined that Kabir was rampantly misinterpreted by sects that created a magical aura round him and used it to perpetuate the same orthodoxies. This trend was the game-plan of powers that did not want his real message to percolate down to the masses. Eklavya also identified the progressive contents in the songs of Kabir and his followers.

Rural Technology and Artisan Development: Eklavya has initiated programmes in fisheries, low cost construction, watershed development etc. These initiatives are meant to serve as training facilities as well as models of appropriate technologies. For instance, Eklavya has set up leather production centres in cooperation with local leather artisans for rural development. The methodology of work involves trying out improved methods and techniques in specific areas of productive activity without harming the environment. On the other hand, Eklavya develops strategies for wider people's participation in developmental and productive processes using these methods and techniques.

Eklavya was conducted in 1992 a base study of socio-economic conditions and production techniques of 8–10 artisan groups in three blocks of Hoshangabad district (Eklavya, 1999). It has initiated a rural leather tanning project in December 1994 on the use of adapted techniques in vegetable tanning to upgrade local leather and for skill development amongst local flayers and tanners. This tannery provides improved leather to local artisans for manufacturing leather goods. It has also used improved cooker techniques for utilizing cattle carcasses for obtaining fat, bonemeal and meatmeal. Eklavya identified the major problems and limitations of the existing practices in house-building in local field areas by poorer sections. By providing a solution to this, Eklavya has taken up a study on the low-cost construction with the objective of planning possible support work. Besides, Eklavya has formulated a fisheries programme to set up a Fisheries Resource Centre to support the development of fish breeding in two districts, i. e. Hoshangabad and Dewas. This is to be achieved through production of fish seed, fry and fingerlings as well as training programmes in fish breeding.

It can be summarised that Eklavya's members tried to make people aware of the utility of local planning and use of resources at panchayat level. They tended to advocate that centralised planning and development activities of the government by themselves can not make best use of the local resources. And that panchayat level planning by panchayat people themselves might be best suited for optimum use of local resources.

as the other ten Gurus. Kabir openly criticised all sects and gave a new direction to the Indian philosophy. This is due to his straightforward approach that has a universal appeal.

Protest on Bhopal Gas Disaster: A significant intervention by Eklavya was in the case of the 1984 Bhopal disaster when lethal methyl isocyanate (MIC) gas leaked from a Union Carbide Plant at Bhopal into the densely populated city. Hundreds of thousands of people were seriously affected; the number of deaths so far is estimated at several thousands. Eklavya took upon itself the task of creating a *Jan Vigyan Samiti* (People's Science Society), a network of science-society groups in order to support the victims through technical, medical and scientific information and intervention, which included a spot survey of the water, air, flora and fauna, particularly vegetables. Eklavya also commissioned independent scientists to monitor Bhopal's fields, gardens and water supplies for MIC breakdown products and published a *People's Report* on public health concerns in the city. With the official organs woefully unprepared to handle such a massive tragedy, and with no factual information on the gas leak and its toxic effects coming forth to the public, the disaster had brought home starkly the relevance of PSM.

During post-Bhopal Gas leak incident, in association with Medico Friends Circle (MFC), Eklavya tried to bring S&T of the tragedy into the public domain. In so doing, they accused the government of withholding information regarding cyanide being a component of the gas and brought to question the competence of its scientific establishment. It is in this context, an alternative scientific establishment was visualized rather than presenting two sides of science. First, the modern reductionist attitude sees advances in S&T not being inexorably harmful to the environment and modern science does not have to be diametrically opposed to ecological health. Second, it could prompt the formulation of new international standards/protocols, for risk-regulation and the 'Right to Know' policy. Eklavya exhibited how people's lives are threatened, they are denied knowledge of the threat so that they can neither anticipate nor resist threats, nor can they cope with the destruction of human lives. The entire Bhopal gas leak tragedy questions these assumptions in fundamental ways.

Addressing the Gender Question: Eklavya has identified the minimal participation of women in the PSM. This was pointed out in the wake of the declaration of women's decade from 1975 to 1985 by the UNO. During the year 1983–1984, Eklavya started working on awareness of women's health with local relevance. From 1992 to 1995, Eklavya engaged in the annual workshops, called as *Sakhi Samavesh* (gathering of girls) where 'Health' was the major theme and 'women's rights', 'women's employment', and 'training in utilitarian skills' etc were other themes. The Adolescent Health and Education programme started in 1997 for girls was meant to sensitize girls as to how gender is the basis of many relationships and how they can develop healthy relationships with family, friends and male members of the society. The book *Beti Kare Sawal* (Queries by the Daughter) was an outcome of this programme. The topics covered in this programme were 'anatomy', 'reproductive health', 'reproductive system', 'menstruation and menstrual problems', 'puberty in boys' and girls', 'pregnancy', 'contraception', 'sexuality', 'rape', 'infertility', 'sex-determination', and 'HIV-AIDS', and 'primary healthcare'. In 1999, Eklavya organized training workshops in 21 middle and higher secondary schools for girls. The focus was on 'how the fertility of a woman affects her social statuses'. Such workshops were done through innovative methods like debates, games, story-writing and group discussions. Eklavya was also extending the concept of people's health to include health care, nutrition, safe drinking water, sanitation, employment and basic housing rather than equating health with disease, doctors, hospitals and drugs.

Transformations and Renewal

As the new areas of work get added into Eklavya's activities, the debate raised within Eklavya certain questions: Should one management council look after policy and decision making of education, publications and development? Do programmes in education and those in development require a different environment, in the sense of work culture, organizational setting, types of manpower etc? In response to these debates three alternative organizational forms were suggested to house the development programmes. These alternatives suggested that development should be:

(a) carried out as another set of objects within Eklavya, to be coordinated by the existing 'coordinating and decision making' systems;

(b) to organize a set of activities in development under a separate institution within Eklavya;

(c) to form an independent organization, especially for this purpose.

Consequently, Eklavya was bifurcated into two autonomous units such as a school education and publication unit and a rural development unit in the year 2003. The rural development unit was registered as a new society on August 11, 2003 as the *Samavesh* Society for Development and Governance. The literal meaning of the word *Samavesh* is inclusion. Like Eklavya, it is also an NGO. A total of 32 staff members of Eklavya left to join the new society in 2004.

Several implications emerged from Eklavya's experiments. First, the understanding of the field and the community of science activists get constituted by it. Science teaching programmes like HSTP was a critique of the modern Indian S&T education which had a British origin. Drawing from Pierre Bourdieu's notion of the "(scientific) field", the field of critique can be seen as constituted by various science activists, teachers, actors/intellectuals who exhibit competing societal knowledge interests, in which the specific issue at stake was the mobilization of various kinds of resources to counter the forces behind the hegemony of modern western S&T education. Second, it has attempted to address a range of issues related to science curriculum reforms; its implementation as well as the continuation. HSTP reminds us how tenacious one has to be to challenge the 'system' or the status quo persists. Third, the hegemony of the formal state curricula (Rampal, 2003) on alternate non-formal initiatives like HSTP has continued to force non-governmental schools to be relegated to the margins of unrecognized institutions, with no systems of accreditation and certification. Finally, it adds an alternative mode of knowledge conception, production and utilization to the larger Indian science movement.

Conclusion:

The five cases of radical PSMOs and the like have survived and thrived in India, because of the vibrant democracy there. The Indian democratic state is not only forced to concede enough space in the public domain to the civil society elements but also rendered tolerant of their divergent ideological shades. The PSMOs are of course an active and vocal lot among the civil society elements. The present exercise makes it abundantly clear that these PSMOs have of course managed to achieve their own goals and have thrived in a limited sense. But as a whole these have made certain note worthy but subtle points that deserve scholarly attention. Having formed an umbrella organization like AIPSN the various people

science movements in India have proved to be capable of renewing themselves and adapting to changing economic and political dynamics of Indian society. By adopting newer action programmes (e. g. issues of ecology, issues of pollution, climate change, issues of reproductive health of women, drug abuse, IPR, anti WTO and MNC, anti-Indo-US nuclear deal etc) apart from their original programmes (e. g. literacy, indigenous knowledge systems, nuclear radiation/leakage, and the like) these have proved their adaptabilities. The very origin of AIPSN from KSSP lead *Kala Jathas* is evident of the fact that the PSM could renew itself through diversification and move ahead. And by forming an all India umbrella organization like AIPSN with large number of affiliated PSMOs, these also proved that the movements can make alliances among themselves and renew the movements over decades and even re-organize and strengthen themselves by coming under one bigger umbrella organization when the original PSMO (KSSP) fades away. Similarly the subsequent birth of BGVS from the same movement of course with an initiative from the central government entails that the PSM had developed enough adaptabilities and even it could mend fences with the central government against which it had set out the movement itself. The other noteworthy evidence to corroborate our view could be the case of Eklavya where the two grassroots level organizations like the *Kishore Bharati* and the *Friends Rural Centre* merged together to bring into action the well known HSTP for a radical science teaching programme. And before completing thirty years to become obsolete and unable to continue further it renewed itself by forming another PSMO named, the Eklavya. Although Eklavya carried forward part of its activities but subsequently went for expansion with newer agenda and later bifurcated itself again to renew itself. Thus it should be clear that the locus of the movement continuously renews itself through its adaptabilities and this impetus accordingly takes the form of organizational renewals and reformulations. The locus of the movement of course constitutes the movement intellectuals who have been rich sources of creative ideas and hence successfully could add to the dynamism of the movements (without letting these die down). The movement has revealed its own dynamics over decades.

Another note worthy point in the context of this movement is the response of the Indian state. As the movement was growing wider and involving more and more intellectuals as well as people a centrist Govt. at New Delhi of course could not ignore it. It becomes too obvious to say that it would certainly like to relate itself to such a movement if not try to completely take over it. Having known that taking over such movements would not be feasible as well as viable in the long run, it tried to relate itself by initiating an organization like BGVS where it could allure the leader of the movement with a chair and resources, of course with some freedom. This view stands vindicated when we observed the desperate efforts of the DST (GOI) to form an all India umbrella organization named the NCSTC where it tried to rope in many of these PSMOs. With its sustained efforts DST succeeded in forming NCSTC with the affiliation of dozens of PSMOs. Thus the government has been able to relate itself to these voluntary and leftist dominated PSMs and has not alienated itself.

With regard to the comparability of these movements with the science movements from other parts of the world, as discussed earlier, the Indian PSMs seem to be unique. Because the science movements from USA, Europe and Australia discussed earlier were pure types as these were truly science movements that emerged within the domain of professional science, involved only professional scientists and their conduct (with exceptions). Hence those science movements remained confined very much within the realm of science. Whereas the Indian science movements were that of the people, initiated by the people, led by the people formed their organizations and related to the domain of S&T (involving amateur as well as

professional scientists and engineers) through their own issues and in their own ways. Of course being people centric the Indian science movements have assumed definition of science/ technology (some what different from that of the western) which is more inclusive and not strictly professional. In this context the science/ technology movements of the former Soviet/ eastern block come much closer to that of the Indians (may be because both were guided by the same ideology and both emphasized science popularizations). However the science movements of the then Soviet/eastern block were guided and driven by the state and the Indian ones are guided and driven by the activist intellectuals (implying its voluntary nature) and poised against the state and its dominant S&T.

Besides the observation on renewal and expansion of the movement it is desirable that we note the subtle points of imprint made by this movements: (i) These PSMOs have worked as pressure groups to make S&T in India more people oriented; by saying Science for Equity (socialism) and for Social justice. (ii) These have worked as critiques of state S&T policy and hence have succeeded to some extent in linking state science to the people. The state science is not merely linked to the people as deliverable goods and services but through people's organizations like these PSMOs. There have developed strong institutional linkages between the state science and people through these voluntary people's organizations (not through state science organizations). (iii) These PSMOs have kept alive the bottom-up approach to policy making and governance in science/ knowledge in India. Along with the top down approach, concomitant is the bottom-up approach that is permissive of feedback as well as new ideas moving upward from the people through these civil society elements. Thus it had strengthened the Indian civil society vis-a-vis state. (iv) Further, these have succeeded in linking science of the state with the rise of people's science, i.e. indigenous knowledge systems that are traditional and culturally embedded. These have encouraged the embodiment and growth of the articulations of the notion concerning 'indigenous sciences and technologies' and the 'alternative sciences and technologies' (the latter being inclusive of the former as all the alternative sciences and technologies are not necessarily traditional). (v) These have also brought recognition to and provided legitimacy to the indigenous and alternative sciences and technologies in India. (vi) A low-cost method of campaigning like, street theatre has shown the necessary flexibility to articulate local issues and forge a more intimate relationship with the people and audiences. (vii) These have handsomely contributed towards the literacy and the environmental movement in the country. (viii) It is true that a robust Left movement gives the background for a wider response to the larger PSM and the two complement each other, and to the process of raising people's consciousness towards S&T.

References:

Andrews James T. (2009). A Soviet Scientific Public Sphere: From Lewis to Khrushchev's time in Soviet Russia, 1917–1964 // *Communicating Science in 20th century Europe; A Survey on Research and Comparative perspectives* / ed. by Arne Schirrmacher. Preprint 385. Max Plank Institute for History of Science, Germany.

Anthony C. and Luke C. (1990). A Statement of Purpose // *Race, Poverty, and the Environment*. Vol. 1. № 1. P. 1–2.

Barber B. (1953). *Science and the Social Order*. London: George Allen & Unwin Ltd.

Beckwith J. (1986). The Radical Science Movement in the United States // *Monthly Review*. 1986. July-August. http://www.fndarticles.com/p/articles/mi_m1132/is_v38/ai_4325189.

Beteille A. (1980). *Ideologies and Intellectuals*. Delhi: Oxford University Press.

- Beteille A.* (2000). *Intellectuals, Antinomies of Society*. Delhi: Oxford University Press. P. 57–82.
- Castells M.* (1996). *The Rise of Network Society, Volume 1 of the Information Age: Economy, Society & Culture*. Oxford: Blackwell.
- Chandhoke N.* (2001). The ‘civil’ and the ‘political’ in civil society // *Democratization*. Vol. 8. № 2. P. 1–24.
- Cross Roger T. and Price Ronald F.* (1988). J. D. Bernal and Science Education: A Tribute to the 50th Anniversary of the Publication of the Social Function of Science // *Research in Science Education*. Vol. 18. № 1. P. 152–159.
- Cross Roger T. and Price Ronald F.* (1989). Science Education in the Shadow of Michael Polanyi // *Research in Science Education*. Vol. 19. № 1. P. 47–56.
- Deakin N.* (2001). *In Search of Civil Society*. Basingstoke: Palgrave.
- Diani M.* (1992). The Concept of Social Movements // *Sociological Review*. Vol. 40. № 1. P. 1–25.
- Diani M.* (1995). *Green Networks: A Structural Analysis of the Italian Environmental Movement*, Edinburgh: Edinburgh University Press.
- Dickson D.* (1974). *Alternative Technology and the Politics of Technical Change*. Great Britain: Fontana/Collins.
- Dighe et al.* (1991). *Campaigning for Literacy — The Experience of Bharat Gyan Vigyan Jatha: An Analytic Documentation Study*. New Delhi.
- Eklavya* (1999). *Eklavya — A Profile*. Bhopal: Eklavya.
- Eklavya* (2005). *New Beginnings: A three year report of Eklavya Foundation (2001–2004)*. Bhopal: Eklavya.
- Eklavya* (1993–2004). *Annual Reports*. Bhopal: Eklavya.
- Elzinga A.* (1988). *Bernalism, Comintern and the Science of Science: Critical Science Movements Then and Now // From Research Policy to Social Intelligence / ed. by Jan Annerstedt and Andrew Jamison*. London: Macmillan Press. P. 87–113.
- Ferguson A.* (1980). *An Essay on the History of Civil Society, with a new introduction by L. Schneider*. New Brunswick, NJ: Transaction Books.
- Freire O. and Shor I.* (1987). *A Pedagogy for liberation: Dialogues on Transforming Education*. London: Macmillan.
- Ganguli P.* (1976). ‘Science Teaching in Rural India — an experiment’ // *Fulcrum*. January.
- Gellner E.* (1995). *Civil society and its future // Civil Society: Theory, History, Comparison / ed. by J. A. Hall*. Cambridge, MA: MIT/Polity Press.
- Gerlach P. L. and Hine V. H.* (1970). *People, Power, and Change: Movements of Social Transformation*. Indianapolis, IN: Bobbs-Merrill.
- Guha Ramachandra* (1988). *Alternative Science Movement: An Interim Assessment // Lokayan Bulletin*. Vol. 6. № 3. P. 7–25.
- Guha Ranajit* (1982). *Introduction // Subaltern Studies — Writings on South Asian History and Society / ed. by Ranajit Guha*. Vol. 1. Delhi: Oxford University Press.
- Guha Ranajit* (1998). *A Subaltern Studies Reader*. Delhi: Oxford University Press. P. 136–145.
- Gummett Philip J. and Geoffrey L. Price* (1977). *An Approach to the Central Planning of British Science: the Formation of the Advisory Council on Scientific Policy // Minerva* 15. № 2. P. 121–143.
- Howell J. and Pearce J.* (2001). *Civil Society and Development: A critical exploration*, London: Lynne Rienner.
- HSTP. (2002). *Thirty Years of Hoshangabad Science Teaching Programme (1972–2002): A Review*. Bhopal: Eklavya.
- Isaac T. M. Thomas* (1997). *From Anti-feudalism to Sustainable Development: The Kerala people’s Science Movement’ // Bulletin of Concerned Asian Scholars*. Vol. 29. № 3. P. 34–44.
- Jaffrey A. et al.* (1983). *Towards a People’s Science Movement // Economic and Political Weekly*. Vol. 18. № 11. P. 372–376.
- Jain A.* (2002). *Networks of Science and Technology in India: the Elite and the Subaltern Streams // AI & Soc*. Vol. 16. № 1&2. P. 4–20.
- Jana Vignana Vedika. <http://www.jvvp.org>.

Jayan T. V. (2003). Crusaders of Science. Down to Earth. 11–15 November, New Delhi: Centre for Science and Environment. Source URL: <http://www.downtoearth.org.in/node/13700>.

Khilnani S. (2001). The development of civil society // *Civil Society: History and Possibilities* / eds. S. Kaviraj and S. Khilnani. Cambridge: Cambridge University Press. P. 11–32.

Krishna V. V. (1997). Science, Technology and Counter Hegemony: Some Reflections on the Contemporary Science Movements in India // *Science and Technology in a Developing World* / ed. by Terry Shin et. al. London: Kluwer Academic Publishers. P. 375–411.

Krishnakumar K. K. (1977). Science for Social Change: The Kerala Sashtra Sahitya Parishad // *Social Scientist*. Vol. 6. № 2. P. 64–68.

Masih A. (1998). Hoshangabad Science Teaching Programme — An Introduction. New Trends in Science Curriculum. New Delhi: Manak Publications.

Mukund K. (1988). The Hoshangabad Science Teaching Programme // *Economic and Political Weekly*. October 15. P. 2147–2150.

Narayan E. K. (1999). Communication Methods of Kerala Sastra Sahitya Parishath // *Communication Processes, Media and Social Change* / ed. by B. Bell et al. www.ias.nl.

Parayil G. (1992). Social Movements, Technology and Developments: A Query and Instructive Case from the Third World // *Dialectical Anthropology*. Vol. 17. № 3. P. 339–352.

Piscina T. R. (2007). Social movements in the public sphere: New forms of communication arise and transgress old communication codes. Zer English edition.

Rahman A. (1970). Scientists in India: the impact of economic policies and support in historical and social perspective // *International Social Science Journal*. Vol. XXII. № 1. P. 54–79.

Raina D. (2005). Multicultural and Postcolonial Theories of Science and Society // *Sandhan*. Vol. 5. № 1. P. 1–32.

Rampal A. (1992). School Science in Search of a Democratic Order // *Social Scientist*. 20(7/8). P. 50–74.

Rampal A. (2003). Counting on Everyday Mathematics // *Cross Cultural Perspectives in Human Development: Theory, Research and Applications* / ed. by T. S. Saraswathi. New Delhi: Sage Publications. Ch. 11.

Saldanha D. (2003). The Bharat Gyan Vigyan Samithi: Organization, Intervention and Perspectives in the Literacy Campaigns. Mumbai: Tata institute of Social Sciences, March.

Sorensen E. (2007) Scientific activism: signing on // *Nature* Vol. 447. P. 374.

Vaidyanathan A. et al. (1979). People's Science Movements // *Economic and Political Weekly*. Vol. 14. № 2. P. 57–58.

Varma R. (2001). People's Science Movements and Science Wars? // *Economic and Political Weekly*. Vol. 36. № 52. P. 4796–4802.

Werskey P. G. (1971). British Scientists and Outsider Politics: 1931–1945 // *Science Studies*. Vol. 1. № 1. P. 67–83.

Williams M. (1993). Building Bridges... Plan the Span // *Everyone's Backyard*. Vol. 12. № 4. P. 18.

Young M. (1977). Science is Social Relations // *Radical Science Journal*. Vol. 5. P. 65–131.

Zachariah M. (1989). 'People's Movements and Reform of Formal Education: Reflections on Kerala Sastra Sahitya Parishad (KSSP) in India' // *Canadian and International Education*. Vol. 18. № 1. P. 3–19.

Zachariah M. and Sooryamoorthy R. (1994). Science for Social Revolution: Achievements and Dilemmas of a Development Movement: The Kerala Sastra Sahitya Parishad, New Delhi: Vistaar Publications.

Zasztowt L. (2009). The Political background of Polish and Soviet Science Popularization Popularization in the post World War period // *Communicating Science in 20th century Europe; A Survey on Research and Comparative perspectives* / ed. by Arne Schirrmacher. Preprint 385. Max Plank Institute for History of Science, Germany. 2009.

Ziman J. (1971). The Impact of Social Responsibility on Science // *Science Today*. December.

Zimmerman D. (2006). The Society for the Protection of Science and learning and the Politicisation of British Science in the 1930s // *Minerva*. Vol. 44. № 1. P. 25–44.