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Kerala Sasthra Sahithya Parishath

Publisher's Note

The All India People's Science Network was formally constituted in 1988, just after the first All India People's Science Congress, held at Kannur, on the occasion of the Silver Jubilee of the Kerala Sasthra Sahithya Parishath. At that time Dr.B.Ekbal and Dr.T.M.Thomas Isaac together presented a paper entitled **Science for Social Revolution**, a slogan formulated by the KSSP in 1973, to guide its own activities. This slogan has been guiding KSSP since then.

For KSSP it means the following : (i) partisanship towards poor (ii) arming their movements with the weapon of scientific knowledge and (iii) reversing the ongoing process of impoverishment of the many and enrichment of a few, at the expense of the many.

The People's Science Movement at the national level too is partisan to the poor, but it had never formulated an overarching slogan for itself. Attempts to delineate a clear perspective for the PSMs have been going on from the very beginning.

During the 13th All India People's Science Congress held at Thrissur in 2010, one full day was set apart for the discussion on the "Perspective of the PSM". KSSP is now celebrating its Golden Jubilee. It is appropriate to continue the discussions initiated during 1988 and continued till date and take them to a commonly accepted framework which can focus the multifarious activities of the PSM towards a desired goal.

This collection of papers is expected to form the basis for the continuation of this discussion.

Kerala Sasthra Sahithya Parishath

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Part I
Science for Social Revolution

Dr.B.Ekbal and Dr.T.M.Thomas Isaac

The development of People's Science Movements (PSMs) is relatively a new social phenomenon in India. There have been numerous educational groups working for the popularisation of science in regional languages some of which can be traced to the pre-independence period. Scientists like Satyendra Nath Bose themselves had taken the initiative to form Bangiya Vigyan Parishad, Assam Science Society, Bigyan Prachar Samiti, Orissa and so on.

More recently, the '50s and the '60s saw the emergence of numerous voluntary groups around various aspects of the application of science and technology in the development process, especially in the rural areas. Even though the professional scientific organizations have, by and large, continued to confine themselves to the narrow concerns of their disciplines, a large number of individual scientists, dissatisfied with their scientific practice, have increasingly been drawn to science-based social activist groups. The gulf between what is the realm of possibility through the application of modern science and technology and what has been achieved in 40 years of independence could not but arouse the indignation of a concerned intellectual.

The above stirrings have mostly been at the level of groups working at micro regions or around some specific issues. But there are a few instances where science-based social activism has developed into mass movements or revealed such a potential. The Kerala Sasthra Sahithya Parishath is one such people's science movement. The KSSP has evolved into a mass movement seeking to popularise science and the scientific attitude among the people, to arm them and their organisations with science, to mobilise people against the abuses of science, to campaign for alternatives that are more in conformity with interests of the people and to agitate for the development of self-reliant science and technology for the nation. All these have been sought to be captured through the slogan of the Parishath : "Science for Social Revolution."

The Parishath, however, was not built according to any previously defined and elaborated programme or ideology. At the time of its inception the KSSP was merely an organisation of

science writers in Malayalam. The slogan 'Science for Social Revolution', as well as the programmatic understanding that has come to be associated with it, has gradually evolved through activities of a quarter of a century and experiences. The present paper is an attempt to document the above evolution rather than present a chronological narrative of the events in the Parishath's history.

I
THE FORMATION : 1957 - 67

The genesis of the KSSP may be traced to the formation of a Science Literary Forum (*Sasthra Sahithya Samithy*) in 1957 by a group of concerned activists and science writers who had gathered in connection with a traditional arts festival at Ottappalam.[1] Despite the best intentions, the pioneering attempt proved to be uneventful but for the publication of a book on "Modern Science" modeled after the Penguin Science News Series and an unsuccessful attempt to translate Darwin's 'Origin of Species' into Malayalam.

In early 1962, a group of science writers in Calicut, quite oblivious of the existence of the Science Literary Forum, took the initiative to organise a Forum for Science Writers.[2] They were able to win the co-operation of most of the leading science writers in the state, and finally, in September 1962, the Kerala Sasthra Sahithya Parishath (styled in English as 'Science Writers Forum of Kerala') was launched with a one-day science seminar and a five-day exhibition on science and science books. The new organisations could lay claim to around 30 members, all of whom were science writers. Occasional symposia and seminars, mostly organised in and around Calicut, constituted the main activity of the group for the next two years.

Meanwhile, in 1966, some of the Malayali scientists in Bombay had begun to actively consider the possibilities of producing science literature in Malayalam. Catalysts for the move were a few young scientists who had returned from Moscow after completing their studies. They were participants in an intense debate among the Indian students in Moscow regarding the social commitment of scientists and contribution that they could make towards the spread of scientific awareness among the people. They even drew up schemes for development of science literature in various regional languages.[3] The contact between the Bombay scientists and the organisers of the KSSP led to the formation of the Sasthra Sahithya Parishath (Malayalam), Bombay in January 1966. Similar organisations were formed for other regional languages and they were sought to be coordinated though a "Federation of Indian Languages Science Association - FILSA". SSP (Malayalam), Bombay was the most active among these groups, with regular monthly discussions on various science subjects in Malayalam. The group also produced four books in Malayalam for a publishing firm in Bombay.

The National Awakening

Production of science literature in their mother tongue was a common concern of all the three groups formed at Ottappalam, Calicut and Bombay. In one sense, they were all responding to the call of the new national awakening that had accompanied the struggle for independence, in Kerala. Development of feelings of national identity among the Malayalees, cutting across the political boundaries that divided the present day Kerala, gave rise to various people's organisations such as trade unions and political parties on an all Kerala basis. The first and foremost among these organisations was the "All Kerala Literary Forum" (*Samastha Kerala Sahithya Parishad*) formed in 1927.However, science literature received only marginal attention from this organisation.

It must be pointed out that science literature in Malayalam was relatively better developed than in most of the other Indian regional languages.[4] The most important contributory factor in this was the higher level of literacy in Kerala and the widespread network of schools. More importantly,

vernacular schools had continued to flourish and played a very important role in Kerala's educational system even during the British period.[5] A textbook committee was instituted in 1867 in Travancore which signalled the beginning of a period of systematic efforts for the production of standard textbooks and standardisation of technical terms and usages in Malayalam. The numerous journals and newspapers, some of them dealing exclusively with non-fiction literature, also contributed in a significant way to the development of scientific literature.

With the attainment of independence, the movement for the creation of a united Kerala began to gain momentum. Demands were made that Malayalam be made the medium of instruction and language of government. The inadequacies of Malayalam to cope with these tasks were also evident to discerning people. Discussions took place in the Samastha Kerala Sahithya Parishad regarding the steps to be taken for the development of technical and science literature in Malayalam. N.V.Krishna Warrier, one of the founding members of the KSSP and an office-bearer in the initial years, argued for a programme of Five Year Plans for the development of science literature in Malayalam.[6] The idiom was evidently borrowed from the Five Year Plans inaugurated in 1951. The emphasis of the 2nd Five Year Plan on the development of modern industry and application of science and technology as well as the declaration of the National Science Policy in 1958 also contributed to the urge to study and teach science.

Thus, the KSSP was responding to an objective, urgent democratic task that had to be undertaken in the society. The secretary of the Parishath wrote introducing the new organisation in 1962 : "We are living in an age of science.... The general laws of science and the discoveries of science, that exert such great influence on the development of mankind, should not remain as the family property of certain experts. Either these experts themselves or some other people have to shoulder the responsibility of explaining them to the common man in a language that he can understand. Because of the stepmotherly attitude to the "native languages" during the period of British rule, there was hardly any progress of science literature in various Indian languages. Speaking everything in English and, that too, in the most obscure English, such was the fashion. The problem of technical words was often an insurmountable problem to those few patriots who dared to write in the regional languages. On the other hand, the conservative local *sastry's* insisted that we have a science created by the great sages of the past that cannot contain any mistakes. Consequently, the awareness of the people of our country lagged behind that of others. Only regional languages can enter into a dialogue with the heart of the common man. The task before the science writers in Malayalam as well as in other regional languages is to convey the message of the new knowledge to the hearts of the people in a style they can easily understand."[7]

Struggle Against Feudal Culture

There was yet another related and equally important tradition that the participants in the new science groups were carrying forward. Modern science had been used by the social reformers and activists in Kerala as a weapon in their struggle against superstitions and feudal culture. Ever since the later decades of the 19th century Kerala had witnessed the emergence of numerous social reform movements. All of them attempted to reform the outmoded social customs and rituals within their respective castes and communities. There was also another dimension to these movements, especially to those movements among the lower castes - the struggle to change the social and political determinants of their lower status in the traditional society. These efforts inevitably conflicted with the key elements of caste domination in the traditional social structure, often leading to ideological positions that had high elements of bourgeois radicalism. This is especially true of the social reform movement initiated by Sri.Narayana Guru, who preached the sutra 'one caste, one religion, one God for man'. Some of his radical followers like K.Ayyappan and E.Madhavan transformed the

sutra into an equally influential slogan, 'No caste, No religion, No God for man'.[8] Rationalist and atheist ideas began to spread. Modern science was an important element of these new movements.

Ten Verses on Science by K.Ayyappan may be considered as one of the best expressions of the fervour with which the social activists of his genre had embraced science : Science is hailed as the great liberator driving our darkness and its high priests and religions. Science is extolled as the only means of knowing truth and the secrets of natural phenomenon. Science is the driving force behind agriculture, industry and trade of the nation. But, however much we may know, since we cannot exhaust the infinite, science urges man to seek constantly.

"Science lights up the world
Science is the progress of the world,
Everything else but Science is darkness
Oh! Science! I bow to you."[9]

The poet concludes. The development of the trade unions, peasant and teachers' organizations and the library movement in Kerala further strengthened the alliance between social activists and the propagation of science.

The Three Streams

Thus we can find three distinct streams of people coming together in the formation of the KSSP. The first is social reformers and activists who see in science a useful ally in their struggle against the outmoded past. Secondly, there were science writers mainly concerned with their professional problems and saw in the organisation a means to redress them. We have already noted that the KSSP at its time of formation at Calicut in 1962 was more in the nature of a professional organisation of science writers. This spirit is evident in the introductory statement of K.G.Adiyodi, the chief organiser of the group : "The problems of science writers are such that they can be solved only through organised efforts."[10] The solutions to problems relating to translation of technical words, publication, the preparation of a 'who is who' of the science writers in Malayalam constituted the main burden of the programme of work. The membership was restricted to science writers. In the first annual conference, the restriction was relaxed. Others were allowed to take associate membership in the organisation. In comparision, the group which was formed at Ottappalam in 1957 seems to have had a wider perspective. P.T.Bhaskara Panicker, the chief organiser of this group was then a school teacher and, more importantly, an active participant in the left movement in Malabar. He succeeded K.G.Adiyodi as the secretary of the KSSP and in 1966 the membership of the KSSP was opened to anyone interested in science.

The third stream of people who contributed to the formation of the KSSP was the Malayali scientists working in various scientific institutions in India. Though Kerala was well-endowed with a widespread school education system, it severely lagged behind in centers of higher learning. Therefore the number of practicing scientists whom the organisation could call upon was very much limited. The active collaboration of the KSSP with non-resident Malayali scientists helped to an extent remove this deficiency. The SSP (Malayalam), Bombay, had a membership of one hundred, almost all of whom were employed in the BARC and other scientific institutions. At least, a few among them were beginning to question the relevance of their scientific practice which they found to have very little relation to the genuine and pressing needs of the common man. Though no one challenged the needs for research in frontier areas and building up of indigenous technological capability, the neglect of problems that weighed down the common man in the present appalled them. Many of them worked in the Department of Atomic Energy which together with Departments of Space and Defence cornered most of the research funds. Some had even started to move

towards critique of the directions in which their own advanced research was moving. M.P.Parameswaran, the chief organiser of the Bombay group finally left his research career to come back to Kerala to participate more actively in the science movement.

Another affiliated group was formed in Bangalore in February 1968. It consisted of Malayali scientists who were working in various Departments of the Indian Institute of Science. A few months latter, a similar group was organized in Calcutta consisting mostly of Scientists working in the Botanical Survey of India and Zoological Survey of India. The members of the Banglore group were the organisers of the South Indian Conference of Science Literature held at the ISSc in 1973.[11] An important contribution of these groups was the science articles for "*Sastragathi*" - a trimonthly started by KSSP in Kerala.

The 3rd annual conference of the KSSP at Olavakkod had decided to start a quarterly *Sastragathi* (The Trend of Science). The KSSP's attempt to persuade the leading publishing houses of Kerala to start a separate science journal in the state had failed. It was this circumstance which compelled the organisation to launch a science journal of its own. The first issue came out in 1966 under the editorial board of N.V.Krishna Warrier, P.T.Bhaskara Panicker and M.C.Namboodiripad. The editorial note emphasised not the problems of Science writers but the urgent need to create a scientific outlook among the people : "It is not enough that the people study science; they must live acordingly."[12] Development of a broad scientific outlook in the society and belief in scientific methodology were claimed to be the essence of the scientific revolution. The journal was to be a small contribution towards the preparation of such a revolution.

The 4th annual conference at Trichur in 1967 was an important milestone in the history of the KSSP. The conference which included representatives from the Bombay group considered and approved a constitution for the organisation and in July 1968 KSSP was registered under the Charitable Societies Act. Thus, by the end of the first decade, the loosely knit science groups evolved into a well defined organisation.

II

MAKING OF A MASS MOVEMENT : 1967-1977

The second decade saw the growth of the organisation into a mass movement. All the basic contours of the present day activities, organisational structure and style of functioning evolved during this period. In this section, we shall briefly survey these developments.

Science in Malayalam

Science through the mother tongue continued to be an important concern of the KSSP. The main theme of discussion of the 4th Annual Conference was the "Problems of Technical Words in Malayalam".[13] The discussions centered around the reasons for the technical backwardness of Indian languages, the urgent need to overcome them and the broad guidelines for such a programme of action. The Conference even set a time bound programme for preparation of a technical glossary of 50,000 words in Malayalam. An annotated bibliography of science articles and an introduction to science writers in Malayalam also were to be prepared.[14] But it was evident that the task was not something that could be shouldered by a voluntary group alone.

The Parishat vigorously campaigned for making Malayalam the medium of instruction and administration at all levels. The first agitational actions of the Parishat - the demonstration before the University Senate - and a mass memorandum to the government were around these demands.[15] These were also the first formal criticisms raised by Parishat regarding government policies. Despite

the many declarations, the Central government was paying little attention to development of Indian languages other than Hindi. Within the state English continued to reign supreme.

A turning point came in 1967. Dr.Triguna Sen, the first non-Hindi Education Minister at the Centre, departed from the tradition by allocating a significant amount of financial resources for the development of regional languages. The then state government in Kerala made use of the grant so received to set up a State Institute of Languages in Trivandrum with a mandate to plan and develop scientific literature in Malayalam. More importantly, most of the technical personnel for the Institute were recruited from the active members of the Parishath in Kerala and outside. It facilitated the development of a collective of KSSP activists at Trivandrum as well as a period of fruitful collaboration between the KSSP and the Language Institute.

The involvement of a group of socially committed activists turned the institute into a beehive of activity and it achieved remarkable progress within a short span of time. The first publications of the State Institute of Languages, *Vijnana Sabdavali* and *Manavika Sabdavali*, were largely the result of the word done by the KSSP during 1967-69. Several dozens of seminars, symposia and workshops were organised under the joint auspices of the KSSP and the Institute. A number of 'workshops' were conducted to translate and edit science books from English to Malayalam.[16]

Publications

Sastragathy, the quarterly journal of the Parishath continued to be published uninterruptedly from 1966, despite serious financial difficulties. The deliberations in the 5th Annual Conference at Trivandrum revealed the urgent need for a science journal catering to school children. Firstly, it was difficult to run a common science journal for all age groups. Secondly, *Sastragathy* was a quarterly which also served organisational functions. Thus *Sastra Keralam* was born in 1969. The 6th Annual Conference at Shornur in 1970 decided to start yet another science journal *Eureka* for the age group 8 to 12. *Sastragathy* was made into a bimonthly and finally in 1974, a monthly journal. The readership of '*Sastragathy*' consisted of Parishath members and the general public above the school age. The Parishath journals developed a unique style of popular science writing in Malayalam. They became the training ground for a new group of young writers. *Sastragathy* alone could boast of having introduced around 50 new writers in the first five years of its existence.[17]

Parishath entered into the field of book publication with great reservation and hesitation. *Science 1968*, the first book published by the Parishath was distributed by another publishing firm. Dissatisfaction with such an arrangement prompted Parishath to sponsor a co-operative society, "Scientific, Technical and Educational Publishing Co-operative Society" in 1971. However, STEPS was found inadequate to carry out the programme of publication that tended to become more and more ambitious as the Parishath's activities grew. STEPS proved to be more conservative and cautious than the parent organisation in taking financial risks.[18] Finally, in 1977, the Parishath on its own announced the pre-publication of a gift box of 10 children's books as its new year present to school children. The first edition of 8,000 copies was sold out and a second edition had to be brought out in the same year. The style and content of the books, the quality of production and relatively low price and the initiative taken by the KSSP activists to collect the pre-publication orders, all contributed to the success of this first venture. It revealed the latent demand for popular science books in Kerala. The organisation was also able to make a substantial financial surplus. Thus began yet another new field of activity.

Into the School System

The journals *Sastra Keralam* and *Eureka* proved to be the first bridges between the KSSP and the formal school system in Kerala. "....By itself nothing extraordinary happened. But occasionally one

boy or girl browsing through it gets some doubt which they try to clear with their teacher. It was an unusual thing, a student asking doubts, that too from outside the text book. Most teachers brush them aside, but occasionally one teacher gets excited, and soon he finds his way to the KSSP ..." [19] In the summer of 1969 another popular programme "A Pre-taste Course" for SSLC students who aspired to join college was started. The aim was to give a pre-taste to the students of the various courses offered in the colleges, nature and importance of various subjects and how these various disciplines are interconnected and related to our daily life.

With the help of sympathetic teachers the KSSP began to get more and more involved in the non-curricular activities in schools. The first major intervention was the campaign launched in 1973 to activate science clubs in schools. Within two years more, than 1500 school science clubs were formed, all of them being affiliated to the KSSP. Success lay in locating motivated and committed school teachers in each of the schools and supplying the newly formed clubs an imaginative programme of activities. Relevant in this connection was the campaign (Open the Kit Campaign) to utilize the science kits and slide and film projectors supplied by the government to the schools. The Parishath brought out a number of popular science articles in *Eureka* and *Sastra Keralam* focusing on school level science activities.[20]

Yet another important activity in the formal education sphere that was initiated in this period was the science talent tests. In 1972 'Sastra Keralam Quiz' was started for high school students. Two years later, the activists in Trichur took the initiative to organize a science talent test for primary school children with the help of the State Institute of Education. The success of the experiment prompted the 'Eureka Science Talent Test' on a state wide scale. The Sastra Keralam Quiz and Eureka Science Talent Test (separately for Lower primary and Upper Primary School Children) proved to be extremely popular with around 4 lakh students participating at school, sub-district and district-level competitions. A certain proportion of the questions asked were drawn from a special text-book prepared by the Parishath each year and the articles that had appeared in Eureka and Sastra Keralam in the relevant year. Scholarships were given to the top rank holders at the district level.

Public lectures and classes

Public symposia and lectures had always been an important form of activity of the Parishat but they were sporadic and mostly urban based. They lacked any common focus and the audience was mostly its own members and sympathisers. A conscious attempt was made in 1972 to initiate a mass education programme around a specific theme. The Parishath responded to the call of "*Bharatiya Vijnan Patrika Samithi* " to observe the 1st week of January as 'Science Week'. 1000 lectures on "Evolution of the Universe, Man and Society" were planned, a target which was over fulfilled. The success encouraged the KSSP to organise yet another mass lecture campaign on a similar them, "Nature, Science and Society" in January 1976. It was estimated that more than 12,000 classes were held and nearly one million people attended the lectures. The fact that this campaign was one of the few legally permitted public campaigns during the emergency was certainly an important factor in its phenomenal success. But it was also a campaign which revealed the organizational maturity of the KSSP.[21] Special notes for the lectures were prepared and about hundred activists were given two days special training. Every effort was made to recruit new resource personnel from outside the organisation to take the lectures. A total of 1500 were involved in the campaign as lecturers. The content of the lectures was so designed that it could be covered in one single lecture or three separate ones. There was also the possibility of adjusting the scope to suit the requirements of various target groups. It all required careful planning and monitoring without curbing spontaneous enthusiasm. The target fixed was ambitious enough to motivate and enthuse the activists. At the

end of the same year yet another lecture campaign was conducted on the "Resources of Kerala". In 1977, lectures were organised on two themes, "Public Health" and "Agriculture in Kerala". Thus the lecture campaign became in important continuing education programme of the KSSP.

The Science Jathas

An important innovation in the mass contact programme of Parishath was the Science Jathas. Perhaps the first Science Jatha in the State was a procession taken out by the delegates after the 8th Annual Conference at Ernakulam in 1970 to the grounds where a public lecture on Science was given. At the next annual conference at Tiruvalla the following year, three one-day Jathas were planned to converge at the venue of the conference. Three groups of professors and scientists from three different towns of Kerala travelled to Tiruvalla in cars, halting in between at various reception centers and explaining the message of the 9th Annual conference. It was indeed an exhilarating experience to many of the participants. The experience of the Science Jatha in 1972, the local level experiments in theatre forms and the mass enthusiasm generated by the 1976 lecture campaign were harnessed together for a bold experiment in science communication the Science Cultural Jatha of 1977. The Jatha consisted of a group of science activists who toured the length of Kerala for 37 days giving lectures at 20 to 30 places a day. In all the Jatha halted at 900 places and contacted more than half a million people and sold pamphlets worth more than Rs.25,000.[22]

Meanwhile, local level Parishath activists on their own had begun to produce and present short plays and songs on various science themes. These experiences were integrated into the Jatha programme. Street theatre, folk dance and music were skillfully used for science communication. These performances became the hallmark of the later Sastra Kala Jatha. The Science Jatha was to become a regular annual programme between October 2nd, the Gandhi Jayanthi day, and November 7th, the birthday of C.V.Raman. To increase the coverage, two Jathas instead of one and later three Jathas would be organised. The jatha also would become a mass campaign to sell science books, each reception centre having to sell a minimum number of Parishath books. Finally every reception centre was encouraged to undertake various complementary activities such as public lectures, exhibitions and science competitions as preparation for the Jatha, transforming the Jatha programme in to a truly massive one-month long education campaign.

The Village Science Forums

The activities of the Parishat up to the early 70's were mostly urban or semi-urban centered. The formation of rural science forums was another conscious effort to link the Parishat's activities to the village where the majority of people live. "... Many activists of the KSSP working for the past 6 to 8 years, were gradually becoming conscious of the fact that things were moving only at snail's pace, that their work was having little impact on society, that the gap between science and society was becoming very large, that confining themselves to educational institutions with occasional outbursts of seminars and campaigns limited their scope. A process of introspection went on for some time with occasional discussions. Gradually it became obvious that unless we faced and addressed ourselves to the economic problems of the society, our efforts were bound to be extremely superficial... As a result, we conceived a programme in which one hundred activists of KSSP would take 10-12 day's leave during the summer holidays, go to villages, stay there, study the economic, social and cultural life there, identify the S&T elements in them and operationalize the KSSP activities on that basis. This never materialized. But the idea spread and the concept of Rural Science Forums emerged....."[23]

The proposals for the formation of Rural Science Forums (Grama Sastra Samithis) by the 12th Annual Conference in 1974 was concretized at a special cadre camp at Peechi. Rural Science Forums

were conceived to be fully autonomous bodies of the villagers themselves which were expected to develop into non-formal bodies for local level planning. An activity spectrum that included various cultural activities, participatory research into village resources and problems, monitoring and evaluation of village level development activities etc.. were suggested. The target was to organise one Rural Science Forum in every Panchayat in the State. The Parishath was to be merely a catalytic agent in the process. The rural science forums were expected to be fully self-reliant and independent entities. The tempo created by the lecture campaigns and science jathas prepared the ground for the entry of the Parishath into rural areas. Rural Science Forums were spontaneously formed by the villagers themselves. In January the fourth journal of *Parishath Grama Sastra* (Rural Science) was started. By 1978 around 600 rural Science forums had come into being.

School for Technicians and Artisans (START) was another activity initiated to help self-made technicians and artisans in the rural areas and in the urban informal sector. Short courses on various technical subjects like electrical wiring, automobile repairing, printing and such other trades are conducted in various centres under the auspices of the START.

In retrospect, it must be said that the rural science forums did not develop as had been envisioned.[24] Majority of the rural science forums formed at the first plush of enthusiasm generated by the public lecture campaigns and Science Jathas and the romantic fervours with which many KSSP activists had plunged into the rural reality, never developed into self reliant local level peoples planning and development agencies. This was especially the case wherever the participation of the KSSP activists in the forums was low. In a bid to activise the rural science forums, they were reorganised as affiliated bodies of the KSSP to work under the general guidelines and direction of the Parishath. A number of state level coordinated programmes for the rural science forums such as state level rural science forum camp, the rural 'padayatras' (1982), village surveys (1980) etc.. were planned. But in practice it was found that the rural science forums were not capable of tackling the microlevel development problems by themselves. There was also severe dearth of resource personnel to cater to the diverse demands arising from developmental problems at microlevel. The result was that the rural science forums ended up in undertaking the general activities of the KSSP or in other words, virtually evolved into rural units of the Parishath. Finally in 1983 the above reality was formally accepted.

The rapid spread of the activity spectrum, during the mid '70s, slowly but surely transformed the nature of the organisation. The basic organisational structure of local units, district and state level committees came up during 1967-75. Apart from this organizational hierarchy, semi-autonomous affiliated organisations such as science clubs and rural science forums had also come up. From an organisation of science writers primarily concerned with technical problems of scientific literary production, the Parishat had evolved into a mass conscientisation movement, taking up a wide range of issues and reaching out to millions of people spread all over Kerala, utilizing a variety of media such as printed and the spoken words and the visual arts.

The new activities in turn brought in new activists. There was a remarkable increase in membership from 122 in 1967 and 500 in 1969 to 2,600 in 1976. Along with the increase in membership a qualitative change also took place in its composition. The bulk of the new members were school teachers who were drawn into the Parishath through the various activities at the school level. Similarly lecture campaigns and Science Jathas led to a rapid increase in members and sympathisers. 40 new units had come up in the Science Month of 1976 itself. The transformation of the active rural science forums into Parishath units made the Parishath a genuinely all-Kerala organisation with units and members quite evenly spread in the rural and urban areas.

These changes were not without their organisational tensions. There were a few individuals who could not grow with the movement. At the cadre camp at Peechi in 1975, the rural science forum was the key subject of excited deliberations. But two or three participants including the former secretary of the KSSP, K.G.Adiyodi, expressed their strong reservations. They felt the KSSP was going beyond the scope of a science popularisation organisation. They also resented the new mass style of functioning that was evolving, which was a contrast of the calm deliberations and debates of intellectuals and professionals of the early years.[26] But none could stem the irresistible flow of mass currents that was propelling the organisation forward.

The Parishath style

It brings us to an important aspect of the KSSP, the Parishat style of work or what has come to be known as *Paarishathikata*. It is difficult to define what exactly it means. In contrast to that of many other organisations, the Parishath style of work is characterised by informality, simplicity, frankness, friendship and collectivity. There is hardly any instance of manipulation or struggle for official positions. By tradition, no one continues in an official post for more than two years. And it is normal for a leading activist not to be even in the executive committee.

Even deliberate measures are adopted to break down any rigid hierarchical ordering. The numerous informal meetings that are organised is an instance. The most important of such occasions is the Annual Camp. It is best to quote a description of the experience of the 1st Annual Camp at Peechi in 1975. "...It was a commune of the best 80 Parishat activists rather than the office bearers. It is still an experience that the activists recall with fond affection. Frank discussions forgetting everything else. Discussions through day and night. Really a Parishath family was evolving and it was there that the mutual friendship, faith and respect that were to be central for all the later Parishath activities were developed."[27] Some of the most innovative programmes of the Parishath have evolved from informal gatherings. It is through them that a collective leadership has emerged.

The Parishath does not receive any regular grant from anyone and no form of monetary help from any foreign funding agency. For the regular activities KSSP depends upon personal contributions of its members both in time and money and upon book publication. But "nobody should feel that he is making a 'sacrifice' for the 'cause'. In reality there is nothing which can be called sacrifice. It is only exchange, giving something in return for something. Only if members enjoy doing work they can be good activists".[28]

Another vital aspect of the Parishath style of work is the importance attached to personal relations between activists. The printed circulars have in no way reduced the importance of personal letters that every office bearer is expected to send to the activists. As the worker's education document of 1981 expressed it, "Those who do not reply to letters, do not keep proper accounts, do not fulfill the tasks volunteered, try to avoid taking up responsibility when requested, do not see the link between the work of theirs and others, instead of creative criticism confine themselves to grumbling and gossiping and those who do not have faith in the goodness of the human being, they can never become good Parishath activists."[29]

III
NATURE, SCIENCE AND SOCIETY

An important contribution of the second decade was the formulation of the objective of the KSSP in an explicitly activist sense : "Science for Social Revolution". We have already noted the emphasis laid by the inaugural editorial of *Sastragathy* on the importance of scientific outlook. The Fifth Annual Conference in 1968 had adopted the propagation of science as the basic task of the

organisation. The 6th Annual Conference in 1969 elaborated it a step further : "Science to the People". Finally, the slogan "Science for Social Revolution" was adopted in the 11th Annual Conference at Trivandrum.

What is meant by scientific outlook ? What are the interrelationships between nature, society, and science ? How could it be used as an instrument for social revolution ? Answers to these and many other questions evolved through concrete experience and study and debate within the movement as well as interaction with others over the next decade.

Social Relations of Science Group

The most decisive influence in moulding the Parishath's outlook in the formative period seems to have been the works of the Social Relations of Science Group (SRS) that developed in Britain during the 1930's.[30] This group of British scientists were deeply conscious of the paradox of the potential for abundance and the reality of scarcity in the capitalistic society that the 1930's dramatically revealed. They were motivated by a conviction that it was only through a thorough transformation of society that the great potential that modern science and technology held out could be fully availed of. And in the search for such a new society, they were not hesitant to openly declare their partisanship to the camp of socialism. They tried to grapple with the complex set of interrelationships between science and society and the social responsibility of scientists, imbued with a deep sense of history and in a manner that hitherto had not been attempted. They were successful in uniting a wide range political opinion around issues of science and technology.

It is interesting in this connection to note that J.B.S.Haldane had been invited to inaugurate the founding conference of the KSSP in 1962. Even though Haldane could not participate in the conference, he evinced a keen interest in the nascent group.[31] When he died in 1964, the KSSP organised a public symposium in Calicut on his life and work. He was held out as a model for emulation.

J.D.Bernal's monumental four volume work "Science in History" was the main source for the preparation of the lecture campaigns in 1973 and in 1976. The recommended reading list for teachers included the books by J.D.Bernal (9), J.B.S.Haldane (6), J.Huxley (4), P.M.S.Blackett, G.H.Hardy and Lancelot Hogben (1 each).[32] The lecture campaign on Nature, Society and Science was an important turning point in the evolution of the ideological outlook of the Parishath. "Organising this campaign gave (it) an opportunity to develop an understanding of the history and philosophy of science which gave more meaning to our task of developing of scientific attitude among the people."[33]

Nature, Science, Society Lectures

The lectures open with a discussion of the concepts of matter, substance and object. A description of the universe from fundamental particles to far off quasars is given. The essential point stressed here is that everything is in motion, that thee is nothing without motion and that motion is the mode of existence of matter. Then two questions are raised. What is time ? And what is space ? After analysis our understanding of both space and time, it is concluded that space and time are specific ways of understanding the motion of matter, that they cannot be separated from matter and its motion. There is no space or time without matter. The concept of matter-space-time continuum is thus established in a simple and logical manner. Reference is also made to the changes in our understanding of matter, the relative nature of knowledge and the confusions it has caused in the history of philosophy.

In the second lecture, the course of evolution of the solar system, the formation of the animate from the inanimate, the evolution of the living beings, the transition from ape to man and the role played by labour and collective life in this transition are presented. Then the social evolution of

humankind is traced from primitive tribal societies in the Paleolithic, Neolithic, Bronze and Iron ages to ancient slave civilizations, medieval feudal societies and finally the modern capitalist societies. The basic differences between capitalist and socialist social systems are presented. Humankind is in a stage of transition from capitalism to socialism. The wanton squandering of natural resources and the waste in the capitalist world have become a threat to the future of human civilisation itself.

The inter-relationship between science and society is explored historically in the third lecture. In early times science was synonymous with daily life experience. The origin of Botany is traced to fruit and root gathering, Zoology to hunting, material science to tool making Dynamics to primitive weapons and so on. Technology and science of the ancient world are discussed. The dark ages of Europe is contrasted with the advances of science in China and India. European renaissance and the 17th Century scientific revolution and its impact on world outlook and the Industrial Revolution and its impact on human thought (with special reference to the emergence of Marxism) are discussed. And finally, the advances of various frontiers of knowledge, changes in the nature of scientific activity and philosophy, problems created by the scientific and technological revolution of the 20th century are surveyed. The students is led to the cross roads that Science and Society have reached.

One major critical reaction to the lecture series was from the religious fundamentalists. *Chandrika*, a Muslim communal newspaper, published a lengthy attack on the Parishath as an atheist and subversive organisation. There were two issues that annoyed the religious conservatives - (a) In the first lecture, after the matter-space-time continuum is established, the question on the origin of the universe is presented as an absurd problem. Origin means prior non-existence and "prior" (i.e. time) cannot exist without matter, it is stated that universe always existed. The presentation gave no place for a creator. (b)The conflict between religion and science received an important role in the presentation of history of science.

Since then the Parishath has come under heavy fire from fundamentalist organisations of all religions. They have also floated parallel science organisations. The Sastra Vichara Vedi of Muslim Communalists has been extremely virulent. It has attempted to imitate the various activities of the Parishath. It also brings out a monthly journal 'Sastra Vicharam' for school children. Even though Christian communalists have not floated any separate science organisations, certain catholic bishops patronise Bharatiya Sastra Vedi in their schools as rival to the Parishath. The RSS has gone one step further. To them goes the credit for physical assault on the Parishath activists.

The KSSP, by and large, has tended to ignore these attacks. While it refused to accept philosophical positions that sought to mix science with religions mysticism, it clarified that it was not an atheist movement. It refused to enter into a debate on god and religion. God is outside the realm of science. The existence or non existence of god is not the central problem of the science movement. The prevalence of religious belief is not merely due to ignorance of science. They have a material basis in social life. There are much more vital issues that arise from the interaction of science and society, which constitute the chief domain of a science movement. Thus even religious people including catholic priests actively participate in the activities of the Parishath. Recently, when certain Christian Bishops issued a circular banning KSSP activities from their schools, it was the radical Christiana organisations that came forward to mobilise people against the ban.[34]

Parishath and Social Revolution

Another issue has been the subject of much discussion within the Parishath and outside is the relationship of the movement to political parties. At the base of the discussions is the concept of social revolution. What is the social revolution that the Parishath is striving for ? The Parishath has sought to explain it as follows : In the society we live in, there is a minority who has ownership and

control of resources and a majority without such advantages. The process of development has been a process of immiserisation of the majority and enrichment of the minority. The vast majority that are getting immiserised or are under the threat of immiserisation constitute the people. The reorganisation of society in order to reverse the process of immiserisation and enable every citizen to lead a full and rich life is the social revolution. Such a society cannot be individualistic and competitive but collective and cooperative. The Parishath is partisan to the interests of the people and this partisanship constitutes the politics of Parishath.

There has been a demand, however, that the Parishath needs to more explicitly define the nature, strategy and tactics of the social revolution and should not hesitate to take up direct political activities. But the Parishath has emphatically refused to undertake such a responsibility. The Parishath is not the sole champion of the interests of the people. The people have numerous organisations of their own such as trade unions, peasants' associations, political parties and so on, each with its narrow or wide objectives and strategies of mobilisation. But there exists a separate space and need for a science-based organisation.

Responding to the demand that "it is not enough to do mere conscientisation work but the Parishath has got to give direct leadership to the political struggle to change the social system", the 'Document for Cadre Training 1982' noted that such a policy would entail a complete overhaul of the movement: "The Parishath will cease to be the Parishath. What if so ? There is no organisation or movement to fulfill the task that the Parishath is undertaking today. There are numerous organisations and movements to lead the political agitations of the people. Even if the Parishath does not get involved, such agitations would proceed. But only the Parishath can undertake the type of activities that it has so far been organising."[35]

It took centuries for the methods of science created by the first scientific revolution to become part of the daily life of the common people in the Western countries. In the Soviet Union, because of the conscious intervention of the state, it took only a few decades. Such conditions do not exist in India. "The Parishath took upon itself to contribute towards this task with the declaration, Science for Social Revolution... Today science is being used by the enemies of the people. Therefore, there is a widespread misgiving among the people that science is anti-revolutionary and anti-people. The slogan 'Science for Social Revolution' seeks to correct this wrong understanding. It also implies a process of taking science, alienated from the toiling masses from its infancy, back to the rightful owners."[36] Science should become a weapon in the hands of the people and their organisations in their struggle for liberation.

Such conscious delimitation of its space or operation has permitted the Parishath to be a forum in which social activists of different political party affiliation or without any such affiliation to work together. The attitude of political parties in the State towards the Parishath has generally been non-antagonistic, but for certain communal parties and reactionary groups that we have already noted. In the cultural milieu of the state, it is difficult for an organisation to take an open anti-science stand. The major political parties consider the Parishath to be an "all party organisation similar to the Library Movement in Kerala.[37] Given the extreme political fragmentation in the State, there can be numerous practical difficulties for such an organisation to function. The style of work - *parishatikatha* - has been a great asset in overcoming such difficulties.

Though the Parishath avoids party partisanship, it actively seeks to develop fraternal relationships with all other organisations and movements of the people. It is impossible to create a scientific outlook in society without taking science to the varied organisations and movements of the people, rendering scientific and technical help to their struggles and entering into a dialogue with them to learn from their experiences. It is interesting that in the "document for cadre Training 1982" an

explicit attempt is made to assess the nature of the Parishath's intervention in the struggle against pollution at Chaliyar from this perspective.[38]

A people's science movement ceases to have relevance to the extent the various other organisations of the people actively take up issues of science and the people come to accept a scientific outlook. Thus, in one sense, the success of the people's science movement, seeking to popularise science and scientific outlook may be measured by the extent to which it makes its separate existence irrelevant in society. It was for this reason that the 'Document for Cadre Training 1982' noted the 'temporary' nature of the task of creating scientific awareness among people and their organisations. But the document also added: "...However it is possible that this 'temporary' phase can prolong for many decades. Such are the complexity and backwardness of our society."[39]

IV
INTO AGITATIONAL CAMPAIGNS : 1977-1987

A distinctive features of the third decade of the parishat has been the spate of campaigns it has undertaken against the various instances of abuse of science and technology. Given the technological backwardness of our country, it was only natural that the initial focus of the movement had been on the need for quantitative expansion of science and technology and their incorporation into the productive process. Scientific outlook was an instrument in the struggle against semi-feudal culture. There was an excessively optimistic view of the social role of science in the present society. The Parishath had relatively ignored one aspect of the Indian reality : the development of capitalism. The incorporation of science and technology in the production process was not taking place in a vacuum but within the parameters of a profit oriented society. The choice made for the maximisation of private profit will rarely be the socially optimal ones. They need not even be the technically optimal ones. It came to be realised that the defence of the people against the adverse effects of science and technology in the service of capital is an important task of the People's Science Movement. The Parishath has taken up a number of such issues as misconceived development projects, environmental pollution by factories, occupational health hazards, drug abuse, militarisation of science and the danger of nuclear war for agitational campaigns.

Kuttanad Development Project

The study initiated by the Parishath regarding the ecological and economic consequences of the water control project in Kuttanad at the request by people in the locality was a nodal point in the development of environmental concern in the movement.[40] Kuttanad is a low-lying deltaic region around the Vembanad lake and the confluence of four major river systems of Kerala. Extensive land reclamations had converted it into the rice bowl of Kerala. But it also reduced the area of water spread accentuating the flood menace. The project involved the construction of a spillway opening into the sea towards the southern end of the lake to control the floods during monsoon and a regulator across the lake, in the north to prevent the incursion of salt water in summer. A scheme for building concrete bunds in the place of the temporary dykes for the reclaimed paddy land was also to be implemented. All these together were expected to make possible double cropping of the whole regional and usher in an era of prosperity.

It was found that the spillway was inadequate to alleviate the problem of floods due to various shortfalls in design. The permanent bunds were not cost-effective and technically deficient with a high failure rate, mostly due to malpractices by the contractors.

The regulator had created a host of unforeseen adverse ecological consequences :

(a) The water weed menace increased in alarming proportion, severely disrupting water transport and fishing and adversely affecting cultivation.

(b) Given the high use of pesticides and fertilisers, water pollution rose above tolerable levels and became a major health hazard.

(c) There was a sharp decline in the fish population with adverse consequences for the income of fishermen and nutrition of the poor.

(d) The decline of the water table during summer created scarcity of drinking water and affected the productivity of tree crops like coconut.

(e) There was a perceptible increase in pests and rodents.

And to crown it all, it was found that the estimate of area the project would bring under double cropping was a gross exaggeration. Most of the area that was claimed to benefit from the project was raising double crop at the end of the 60's, many years before the project was commissioned. Given the high cost of cultivation of paddy in Kuttanad, the crucial determinant of area under cultivation is the price of paddy. Paradoxically the land use data for the period after the commissioning of the project reveals a consistent decline in gross cropped area and an increase in the fallow land.

The report on the project was presented at the 15th Annual Conference of the Parishath at Kottayam in 1978. It proved to be an eye opener for the activists. It forced them to adopt a more critical attitude to devdlopment projects. The cost benefit analysis made by promoters of projects has a tendency to underplay the costs and exaggerate the benefits. Much of the hidden costs are either neglected or underestimated. A conclusion drawn by the Conference was that "it is in the interest of the nation to have a devil's advocate to face the issues squarely and focus public attention."[41]

Anti-pollution struggles

It must be admitted, however, that the involvement of Parishath activists in the environmental problems, especially those related to industrial pollution, predates the Kuttanad study. Kerala by no standards is an industrialised state. But it has a concentration of highly polluting chemical and pulp based industries. No wonder, it was the Parishath activists around the Cochin industrial belt, an area notorious for industrial pollution, that first became interested in the problems.[42] Prof.M.K.Prasad, who was later to head the environmental and health brigade of the KSSP, was the leading spirit of this group of activists. In 1972, they organised a seminar in collaboration with the Cochin Science Association on pollution hazards in the industrial belt. Slowly, they began to get involved in local issues of water and air pollution.

Campaign against water and air pollution by the Gwalior Rayons Factory at Mavoor, in the Chaliyar river basin, was the first major anti-pollution agitation organised by Parishath [43]. The Parishath intervention came after a series of spontaneous protests by the local people. A KSSP team of experts made a detailed study of the problem on the basis of which an environmentally acceptable and technically and economically feasible solution was arrived at. An intense campaign utilizing a wide variety of non-formal education methods to mobilise public opinion was undertaken. The Parishath's basic position was that it was possible and feasible to run the factory with adequate safeguards against pollution. The Management was the main culprit that blocked such a solution. The campaign made it possible to build up a wide popular front of local people and workers against the management. But the struggle turned out to be a long drawn out one. New issues arising from macro-economic policies affecting the rayon industry in general made the struggle even more complicated.

The struggle of Chaliyar set an example for local level intervention in factory pollution problems. Since then the Parishath has been involved in numerous anti-pollution struggles in various parts of

Kerala, the most prominent being those connected with Velloor News Print Factory, Kallada river, Titanium factories in Trivandrum and Chavara and Moti chemicals in Cannanore.[44] These struggles also drew the Parishath to the midst of controversies. The Parishath was severely attacked by the managements, at times by trade unions and even by individuals and groups, some of whom genuinely feared that the rising environmental consciousness can hinder prospects of industrial development in Kerala. Environmental protection is seen by them as a luxury that a backward state like Kerala cannot afford. While decisively rejecting such facile postures, the Parishath had to be cautious not to permit degeneration of campaigns against pollution into campaigns against the industry itself. An illuminating case in this connection is that of the struggle at Moti Chemicals, Cannanore. It was one of the broadest based struggle against industrial pollution in Kerala involving units of all political parties and organisations in the locality. Given the bitter experience of a similar factory at Trivandrum, the initial callous indifference of the management and the high brow attitude exhibited by certain government experts roused the passions of the people and transformed and struggle into one against the establishment of the factory itself. The Parishath was the only organisation in the locality that publicly took a stand that the factory must be permitted to be established with adequate safeguards.

It is not possible to survey the issues and the debates thrown up by each of the Parishath environmental campaigns. We shall confine ourselves to a systematic survey of the debate in connection with the most controversial of the environmental interventions of the Parishath, the campaign against the Silent Valley Hydro Electric Project (SVHEP).

The Silent Valley Campaign

The SVHEP consisted of a dam across Kunthipuzha flowing through Silent Valley in order to produce 522 MU of energy. With a high head it was an ideal site for generation of hydropower, the cheapest and the cleanest source of electrical energy. It was one of the few suitable sites for hydro electric generation in the northern part of Kerala. It was also a fulfillment of the long cherished dream of the people of Malabar, a relatively more backward and power deficit area. The project was sanctioned in 1973 and the preparations of the work started in 1976.

The controversy regarding the project arose when certain officials of the government of India raised questions regardiang environmental implications of the project and a task force of the NCEPC on the ecological problems of the Western Ghats recommended that it be abandoned or be undertaken only under stiff safeguards.[45] The issue was raised within the Parishath in the Annual Camp of 1977. But it was only after a year long discussion and debate, strictly within the movement, that at the Annual Conference of 1978 a resolution was adopted opposing the implementation of the project. The devastating critique of the Kuttanad Development Schemes that was being discussed in connection with the conference might have also influenced the unanimous support that the resolution received.

The basic arguments of the Parishath against the project were presented in the document "The Silent Valley Hydroelectric Project, A Techno-Economic and Socio-Political Assessment" drawn up by an interdisciplinary expert team of the Parishat activists.[46] Besides their own field trips to Silent Valley, the team relied on the investigations conducted by the Kerala Forest Research Institute, studies conducted by scientists in the Botanical Survey of India, the Zoological Survey of India and the Geological Survey of India and the report of the task force of NCEPC for their assessment of the ecological consequences of the project.[47]

The Parishath argued that Silent Valley is one of biologically the richest, oldest, least disturbed, and largest continuous stretches of forest in the Western Ghats which could be protected. Its

floristic compositions are one of the most complexes and not yet studied. It is a gene pool of immense utility for the future. It is the habitat of at least three endangered species of animals including the Lion-tailed Macaque, the second most threatened primate in the world. The construction of the dam would submerge 830 hectares of reserve forest including the invaluable riparian ecosystem. The reduction in the forest area will make the Silent Valley habitat of Lion-tailed Macaque non-viable and can lead to the extinction of the species in the valley, one of the last two viable populations surviving today. Further, the study stressed that the interaction problems will have a cascading effect resulting in irreparable damage to the ecosystem. No safeguards can prevent these adverse consequences. The experiences of the consequences of the hydroelectric projects in Kerala on the forest did not give cause for any optimism in this regard. The Parishath, however, held that SVHEP has to be assessed not merely on the basis of the ecological consequence but also techno-economic and socio-political considerations. This approach was emphatically announced in the very title of the Parishat study report. After assessing the ecological aspects, the question was posed :

"A question has to be raised at this juncture, whether in spite of all these uncertainties and possible adverse effects, the benefits to be expected from this project are commensurate with the loss of such a unique biosphere. It is also pertinent to examine whether alternative possibilities exist for conferring the same benefits, without destroying this rare tropical evergreen rainforest."[48]

The following was the position of the KSSP with respect to these latter set of issues : The significance of power generated by the SVHEP either in relation to the overall energy position of Kerala or of the southern grid, both in the long and short run, can only be marginal. The overall demand for energy in Kerala cannot be met from hydel sources alone even in a medium term perspective. The sole reliance on hydel sources can prove disastrous in the case of a monsoon failure even in the short run.

Therefore, it is important that Kerala diversify its electrical energy sources. A thermal plant with its short gestation period and the fillip, the availability coal would provide to industries requiring thermal energy will be an ideal alternative to the SVHEP. Or even alternative hydel power stations could be considered. (Only around one third of the hydel sources of Kerala were being utilized). The Central Government was, in fact, willing to consider such alternatives. The immediate problem of power deficiency in Malabar could be solved merely by strengthening the distribution network in Kerala. Kerala had been selling a significant portion of the electricity generated to the neighbouring states. It was this short sighted and narrow commercial attitude of the KSEB that was responsible for the power problem in Malabar. The Parishath also held that the irrigation potential of the project was exaggerated and questioned the cost effectiveness and the technical efficiency of canal irrigation in an undulating terrain. The irrigation requirements of the region may be immediately met using the ground water resources that so far had been neglected in Kerala.

"Thus it can be seen that from techno-economic considerations, the Silent Valley project is neither absolutely unavoidable nor the best immediate solution... Fortunately, the techno-economic considerations are not at variance with the ecological considerations in this case; but socio-political forces are stronger and pitched against them."[49]

The paradox is understandable. The SVHEP had been a symbol of the aspirations of the people of Malabar for a long period and mass organisations and political parties were committed to its implementation long before the ecological questions were raised by the scientists. Ecology was relatively a new branch of science which even the Parishath had not seriously considered till a couple of years ago. Further, unlike in the case of pollution of the Chaliyar, the people in the locality of the project were not adversely affected by it. In the case SVHEP people in the locality stood to benefit from the employment and income generated and by the construction activities. "It

is true that the Silent Valley is one of the richest biospheres in the whole world, but it is also true that for the people of Malabar, the question of energy, of irrigation, of employment and of development is more real, immediate and obvious than the necessity of protecting the unique biosphere of Silent Valley. Without winning over the confidence and co-operation of the people of the locality in particular, and of Kerala in general, the Silent Valley cannot be saved."[50]

Thus started the mass campaign, the most intense and prolonged single campaign organised by the Parishath, in order to save the Silent Valley ecosystem.[51] Thousands of meetings and marches, hundreds of lecture and seminars, exhibitions and theatrical performances were organised. Lobbying political leaders and bureaucrats, articles in newspapers and journals and legal court actions were tried. The national and international interest aroused in the preservation of Silent Valley was also helpful. Eminent scientists and scientific organisations both in India and abroad came forward in defence of Silent Valley. Finally, in 1983, the Central government withdrew the sanction for the project. Opposition to the objections of environmentalists was to be expected from the officials of the KSEB. But surprisingly, the trade unions in the KSEB also took an equally adamant position in favour of the implementation of the project. Counter arguments were posed against every issue that Parishath raised.[52] An attempt was made even to float a rival science organisaion of all anti-environmentalists of all hues and colours.[53] Even though all the major political parties are formally committed to the project, they did not oppose a debate on the issue.

Unfortunately the debate soon degenerated into allegations and insinuations. Ignoring the related rhetoric it is possible to identify four major areas of substantial debate : (a) the specific features of the Silent Valley ecosystem (b) the ecological importance of Western Ghat forests in general (c) the development strategy for Kerala, especially with respect to development of irrigation and power and industrialisation and (d) the theoretical problems of ecology.

The debate

(a) The uniqueness of Silent Valley was questioned by the advocates of the Project. It was argued that the vegetation in the valley was inferior to that of many other parts of the Western Ghats in Kerala and records were produced to prove that there were human interventions in Silent Valley right from the British period. After examining the available evidence, the Joint Committee on the Silent Valley Hydel Power Project headed by MGK Menon, which included representatives of the Kerala Government and the KSEB, concluded :

"The Silent Valley Plateau is the only substantial tract of the Western Ghats which has never had a permanent human settlement. The Silent Valley forest represents a largely undisturbed, uninhabited and relatively inaccessible ecosystem with a significant riparian regime, and richness and diversity of flora and fauna. And from this overall view, it is probably superior to, and in any case, must be regarded as comparable to, any other equivalent area in the Western Ghats."[54]

It was argued that it was not Silent Valley but an Ashambu hill that was the main habitat of the Lion-tailed Macaque. The reference for this position was the study conducted by Green and Minkowski in 1974. The KSSP's reference was the survey conducted by the KFRI in 1979.[55] The latter study, incidentally, also showed that the number of the animals had declined by half during the interval. At any rate, the official attitude of the KSEB to the issue was that "Like all similar species that have reached the peak of macro evolution, the Lion-tailed Macaque is destined to inevitable and natural extinction. This is the natural law of evolution."[56]

Another important aspect that was debated related to the possibility of an ecological cascade. Limitations of space do not permit us to go into details of the arguments. It may be pertinent to quote the conclusion of the Joint Committee once again. The submergence will be of a genuinely

intact riparian ecosystem. It is the view of many that this submergence, as well as activities needed for the construction of the project, which would constitute human interference, will result in serious loss in biological diversity and irreparable damage to the area as a whole. The other view point is that disturbance will be only to the extent of the submergence. It has not been possible for the Committee to reach an unambiguous conclusion on this aspect. It is clear that if one were to exercise caution, the former view must prevail."[57]

The opinion of the relevant scientific institutions, professional associations, eminent scientists and the scientific community in general was overwhelmingly favourable to the positions taken by the Parishath. However, as the Joint Committee rightly pointed out, much more detailed studies are required before the controversies can be finally settled and definitive conclusions reached : The multidisciplinary pioneering investigations conducted by the Committee "have strongly brought out the need for extensive studies of representative ecosystems in various parts of the country, to ascertain the levels of interference which may be permissible in certain areas, and, to delineate these areas which should be kept inviolate."[58] Given this situation, what better rational choice could there be than what was demanded by the 15th October 1978 resolution of the KSSP executive... "that no steps which may cause irreversible changes in the silent Valley Project area shall be taken before the different possible alternatives are studied in detail and proper decisions are arrived at".[59] We are left to wonder what rationality could possibly explain the vandalist spirit with which the KSEB moved in to selectively destroy the very flora and fauna the environmentalists wanted to protect within days after a legal stay on the project implementation was lifted!

(b) The second major area of debate related to the ecological importance of the forests in the Western Ghats to Kerala's future development. Silent Valley, in fact, became for the Parishat a symbol of the struggle against the arrogance, arising from ignorance, callousness and private greed, with which man had been denudating the Western Ghats. The forest cover of Kerala had declined from around 40 per cent at the turn of the century to around 27 per cent. It should be noted that this 27 percent refers to the area that is formally under the forest department. A significant portion of this is nothing but barren hills. The actual natural forest cover without substantial destruction will be less than 10 per cent of the land area, even by the most optimistic estimate.

A number of factors such as unrestricted development of plantations, unscientific logging operations of forest department, the illegal activities of timber contractors, the encroachments by landlords and landless peasants and the rapid and unplanned growth of wood based industries without any relation to the regenerative capacity of the forest are responsible for the present state. The hydro-electric projects have also contributed to the forest destruction. It is true that the area that would be directly submerged by the hydel reservoirs would constitute only a small percentage of the total forest area. But project work open up the otherwise inaccessible forest reaches. The detailed study of KFRI has shown how the implementation of Idukky Project prepared way for the virtual denudation of the whole natural forest in the region.[60] It was emphasised that the possible adverse consequences of large scale projects should be noted and adequate safeguards to be taken.

Denudation of the Western Ghats forests could lead to unforeseen climate changes and could influence the monsoon pattern. Micro climate changes that had already occurred in Idukky were referred to. Destruction of forest coverage and attempt to cultivate the steep slopes can cause severe soil erosion and siltation of the reservoirs during the heavy monsoon rains. The forest plays a determining influence on the water cycle in the Western coast. One hectare of natural forests in the Western Ghats can retain theoretically as much as 30,000 cubic meters of water,

which would later slowly filter down and re-charge the ground water reservoirs and the streams. The recurrent drought in summer even in years of normal monsoon is a pointer to what is in store for the future.

There was little substantive debate on the above issues raised by the Parishath. Major criticism was against an alleged position taken by Parishath against all dams. Other issues were reduced to a question of scientific evidence on the relationship between rain and forest. Much passion was also sought to be aroused against the anti-land reform stand of the environmentalists. The Parishath has opposed any more distribution of forest land for cultivation. It considered that such measures, given the fast dwindling forest area, was a very short sighted populist measure.

(c) The proponents of SVHEP have posed it as pivotal to the development of Kerala and Malabar in particular. We have already referred to the alternatives that the Parishath had proposed. An attempt was made to draw up a district level plan for the development of Palghat.[61] The process accelerated the efforts in the Parishath to evolve a critique of the development strategy in Kerala. Many of the basic premises of development efforts in Kerala came to be challenged. It further widened the scope of the debate. We shall return to it in a later section.

(d) Finally, certain important theoretical problems related to the concept of ecology were raised. A critique of the alleged positions of Parishath on ecology may be summarized as follows: - The demand of the Parishath for the preservation of Silent Valley eco-system is undialectical and contrary to the historical experiences of man-nature interaction. The struggle of man for the mastery over the nature cannot but be a process of creation of imbalances. These may produce unforeseen adverse effects. But modern science helps us to understand these consequences and find solutions for them. The duty of the scientists is to help this process rather than to hold back progress in the name of ecological balance. Solutions to the ecological problems cannot be found within the capitalist system. Solution lies in the struggled to change the society. Ecologists seek to divert the attention from this vital task. Their predictions of doom are a reflection of the deep crisis that has griped the capitalist system. In the context of underdeveloped countries like India, the organisations like the Parishath are unwittingly playing into the hands of imperialism which is consciously using ecological arguments to hinder the development efforts in the Third World.

The following has been the response of the Parishath : It is true that everything in nature and society is in a continuous state of change. But these changes are law governed. The history of human kind is the progressive increase of the knowledge of these laws and practice informed by such knowledge. Freedom is the recognition of necessity. The scientific and technological revolution and the scale of contemporary man-nature interaction have increased the possibilities of unforeseen ecological imbalances manifold. The science of ecology helps us to understand them and take preventive measures. In a capitalist society there is the utmost need for vigilance of the people on this account. The profit calculus of the capitalist does not and cannot take into consideration the social costs neither in the long nor short run. It is not true that science today has the capability to find solution for all the imbalance that may be created. Such claims spring from ignorance as was the celebrated case of the suggestion to preserve the various rare species of animals and plants in the Silent Valley on an artificial island in the reservfoir.[63] As Prof.MGK Menon has emphasised, our knowledge of "such complex ecological systems has not yet reached a stage when the causes and consequences of perturbations in ecosystem can be defined and quantified in determinate one-to-one relationships, and cause and effect understood and explained without ambiguaity."[64] And therefore the demand of the Parishath that no step be taken which might cause irreversible changes before the detailed studies are undertaken. The demand for the

preservation of the ecosystem was not made "for the sake of nature" but "for the sake of man". Scientists like M.S Saminathan, who at no stretch of imagination can be accused of being a "return to primitivism" utopian, has also argued for the abandonment of the project on the ground that "the Silent Valley Rain Forest Biosphere Reserve can become a sanctuary for valuable genes in several medicinal and plantation crops."[65]

V
NATURE, SCIENCE AND SOCIETY: SOME FURTHER CONSIDERATIONS

At the centre of debate ecology were the issues related to interaction between nature, science and society. Surveying the literature we are rather taken aback at the consistent failure (or refusal?) of many of the critics to understand the basic approach adopted by the Parishath right from the early days of its involvement in ecological problems. The first systematic attempt to grapple with the theoretical problems of ecology was made in 1977. It had become customary that a topic be chosen for detailed study and discussion in connection with every annual conference, the results of which were often published in a 'souvenir' to the Conference. The theme for study for the 14th Annual Conference, at Quilon in 1977 was 'Man and Environment.'[66]

Man and environment

The collection included thirteen papers dealing with aspects of biosphere, economic sphere and cultural sphere. There was also an 'Introduction' to the collection attempting to integrate the various papers into an approach distinct from the ideological currents dominant in the mainstream of Western ecological thought. The 'Introduction' specifically rejects the reactionary and neo-colonialist ideological underpinnings in the works of ecologists like Ehrlicks, Forrester and Meadows and concepts like 'Limits to Growth'. "There are extremely informative facts in them. But their conclusions are unacceptable to us. There takes place an inversal of the problem in their perspective."[67]

The 'Introduction', however, emphasised that the dangers of growing ecological degradation is not an ideological illusion, but an important aspect of the contemporary reality. It is enough to have a glance through Kerala itself to realise that pollution, deforestation, disruption of water cycles etc. are real enough to warrant deep concern.

"What is required is a correction or redefinition of the meaning that the Western scientists have given to the concept of environement".[68] Environment is not merely nature or ecology but also includes economic and cultural environment. Man-nature interaction is a social activity involving economic and cultural relations. These "have created a kind of new environment that control human activities as rigorously as his natural environment.... When we discuss the environment of man, it is not enough to consider the natural environment alone. The economic and cultural environments and their interrelationships have also got to be considered. Till now ecologists and environmentalists have talked only about the inter-relationship between man and nature. That is not enough. All the three environments should be considered together. The main aim of this book is to present such a perspective...." [69]

The 'Introduction' in an obvious reference to the antipollution struggle at Chaliyar describes the near insoluble contradictions that confront a struggle against factory pollution in a capitalist society. But at the same time, it firmly rejects fatalistic acceptance of the inevitability of ecological degradation in the present economic environment as well as naive belief in the automatic resolution once the economic environment is changed. A change in the consciousness and attitudes is also important.[70]

The Parishath sees ecological struggles as a part and parcel of the general social struggle. There is no need for the Third World to accept the time schedule followed by the present day developed countries for social interventions to check at least certain aspects of unrestricted greed of the capitalists. The history of factory legislations in our own country is such an example. Thus ecological struggles can today play as an important means of social mobilisation and conscientisation for social transformation. The optimism that has always characteristed the Parishath approach to ecological crisis of our time and the ability of human beings to tackle it was the central theme of the book, The World We Lie In, the subject for the lecture campaign in 1985[71]. The above approach of the Parishath has brought it into conflict with the pure environmentalist groups in Kerala and generated a fair amount of polemics.[72]

Nature of Science

If man-nature interaction cannot be analysed independent of social relations, what about science? Is it neutral or non-neutral? The answer is crucially dependent on the definition 'science' that is adopted. Following Bernal, science has been used in a variety of meanings by the Parishat: as an institution, method, accumulated knowledge, a part of forces of production and as a part of the world outlook.[73] It has always emphasised the unity of hand and head, theory and practice, science and technology and natural and social science. Normally, the concept of science is used in the broad sense of the term inclusive of social sciences. A mass movement based on science cannot ignore social sciences. A major effort to understand the philosophical problems of science was made through a five day study camp in early 1980s. A Major focus of the exercise was to elaborate a critique of trends represented by Fritjof Capra and the revivalist ideological currents in the Indian science movement.[74]

Through interactions with nature, man gains experience which are abstractized and theorized individually and collectively laying the basis for future interaction. The new interaction provides correctness or otherwise of the theory and gives rise to new experiences and the process is repeated. It is a cumulative process both in space and time. New experiences may require revision of the earlier inter-relations - scientific laws - that are established. The new set of laws might be either negatory ie. in a opposition to the old set of laws or inclusive of the old set of laws. The relation of heliocentric theory to the geocentric theory is of the former type while quantum physics is related to the classical physics in the latter way. Similarly laws could be formulated, each set being valid for a limited range of operations. Euclidean, Lobachevskian and Riemannian geometries are examples. Experience of different societies spatially far away might be different and differently collated. This can be seen in the development of science in the ancient period reflecting different degrees and types of empirical knowledge. In certain branches of science such as medicine such differences continue to persist. But the basic methodology of science has been universal, the practice-theory-practice cycle.

If science is defined as merely accumulated knowledge of laws of nature it is neutral and objective. But if science defined in a broader sense to include the process of asking questions and the application of the laws, i.e., as a *social activity*, it cannot be neutral. The questions raised and the uses made of the answers are socially determined. It does not imply, however, as certain science groups have argued, that the modern science is capitalist or imperialist in nature and has to be rejected. Because whatever be the nature of the society in which science develops to enable successful progress of production, it has to reflect the objective reality. Even though science develops as a specialised activity, its roots are in production and fruits are for production. It is the primary social function of science.

But the extent that the ruling classes attempt to use science as an instrument to control and manage social affairs the ideological preconceptions influence and condition the development of

science. Therefore it is important to expose the anti-people ideological preconceptions that enter into scientific theories. It is also important to develop a critique of the science policies from the point of view of the people and pose alternatives that are more responsive to the requirements of the people.

VI
THE DEVELOPMENT DIALAOGUE

The Parishath has attempted to evolve an alternative set of development policies in the context of Kerala. The framework accepts the need for rapid increase in productivity and production but also emphasizes greater equitable distribution, work generation and the sustainability of the process in the long run. It demands an overhaul not only of the present development policies but also of the development administration.

It was the preparation of the book 'The Wealth of Kerala'[75] (*Keralathinte Sampath)* that initiated the Parishath into the development problems of the State. The book was truly a product of the combined efforts of the Parishath's activists and sympathisers in the specialised and advanced centers of research in Trivandrum. The primary aim of the book was to evolve a more scientific understanding of the concept of resources in the concrete context of Kerala and comment upon the development policies and process in the state. The book highlighted the paradox of richness of the resources in the state and poverty of its people.

Since the publication of the book, the contrast between the potential for growth and the poor production performance of the state has become even more sharp[76]. There has been a significant decline of the per capita material production in agricultural and industrial sectors. But for the sharp deceleration of the population growth rate, growth of even overall per capita SDP would have been negative. However, there has been little public awareness of the precariousness of the situation till recently. The high inflow of foreign remittances that enabled the average, Keralite to enjoy a consumption level much higher than the national average created an illusion of economic prosperity within the State. Decline in remittances (which has already become manifest) can give rise to unprecedented social tensions, various disruptive social movements and pressures to dismantle the welfare state structures. The fiscal crisis of the state government has contributed to create a greater awareness of the development impasse among the political leadership as well as the general public. The 'Development Crisis' has suddenly become a favourite topic for journalistic columns as well as seminars and discussions.

'The Wealth of Kerala' had been the reference book for the third lecture campaign at the end of 1976. Since then, the Parishath has published a number of books and pamphlets on the development problems of various sectors of the Kerala economy. In connection with preparation of 'The Village Development Document' and the seminar at the Annual Conference in 1985, an effort was made to link together the sectoral development perspectives that were emerging.[77] The theme of the Annual Conference seminar in 1986 was the problems of industrialisation and that of the following year, the problems of reorganisation of the traditional industries. The book Kerala-Land and Man attempted to integrate the 'resources of Kerala' and the sectoral development policies in a historical perspective.[78] The book on the "Approach to 8th Five Year Plan of Kerala" under preparation, would be yet another important contribution of the Parishath to the debate on the development policies for Kerala.[79]

A close perusal of the public exchanges on the development crisis reveals a perceptible influence of the campaigns on most of the participants including the critics. There have been many criticisms

against the positions adopted by the Parishath. The major criticisms have been related to the effort of the Parishath to incorporate the ecological considerations into the development schemes. Such critics also discern a strong influence of 'small is beautiful' kind of theories on the Parishath. Surprisingly the Parishath has also been under fire for accepting the "western growth models" and their attendant compulsions. And, therefore, it fails to provide any real alternative.[80] Another set of objections are related to the constraints imposed by the federal framework for the regional planning that the Parishath allegedly do not take into consideration. At the same time there are also some who dismiss the Parishath for being 'reformist' and assail it for accepting the national frame work of planning.[81] These and other criticisms, most often contradictory, reflect the perceptions of the critics what the Parishath's position is. Therefore it is important that we do briefly survey the policies propagated by it in the various development sectors.

Agriculture

Kerala's agricultural performance has been dismal. There has been a stagnation or even decline in the overall area under cultivation, productivity and production when compared to the early seventies. But for the relative dynamism exhibited by the plantation sector, particularly rubber, there would have been a virtual collapse of the agrarian sector (Our discussion relates to the non-plantation sector). The Parishath has been arguing for the adoption of an integrated policy framework taking into account the economic, ecological and technical factors as well as the agrarian relations.[82]

(a) The increases in the price of farm outputs have not been commensurate with the increase in the prices of both wage and non-wage inputs. Given the decline in productivity, it has had a deleterious impact on the profitability of cultivation. The level of agricultural prices has been the focus of the agrarian movement in the recent years. But little attention has been paid to the organisation of the marketing of agricultural products in Kerala. Regulated marketing system has not been experimented within Kerala on any significant scale. Improvement of marketing is an area that requires urgent attention.

(b) The emphasis laid on the ecological factors for sustainable agricultural development has been an important contribution of the Parishath. The recurrent droughts in summer and the lowering of the water table in many areas of the state have played havoc with the productivity of crops like coconut. It has impressed the people with the importance of ecological balance. It is therefore an opportune moment to launch large scale measures for the regeneration of the forests in the Western Ghats, local level soil conservation measures and protection of traditional canal-pond network in Kerala. The 'river jathas' through the river basins in Cannanore district in 1986 was a novel attempt to popularise the water conservancy schemes.

(c) The appropriateness of the technical inputs like fertiliser and pesticide, seeds and cropping pattern and irrigation has to be critically evaluated. The Parishath's signal contribution has been to focus the public attention on the scandalous social waste in the major irrigation works in Kerala. Studies have shown that the irrigation efforts have had no perceptible impact on either the trends of area under cultivation or productivity. The irrigation of garden lands has been neglected. No attention has been paid to local level water management. The estimates of irrigation potential of projects have proved to be gross exaggerations. Capital investment per hectare in major irrigation schemes has been inordinately high. The per hectare capital investment for the ongoing projects is above Rs. 40,000. The capital requirement for the projects that are proposed to be taken up is more than Rs.1 lakh per hectare even without considering the inevitable cost escalation due to delays in implementation and inflation. The high cost is due to the undulating terrain of Kerala's countryside and delays in the completion of the projects. The latter is primarily due to the paucity of resources created by the adhoc manner in which new projects have been constantly added to the pipe line even before the ongoing projects are completed.

The Parishath has demanded that no new major irrigation project be taken up and those ongoing projects where no significant expenditure has been incurred be frozen. Meanwhile, a thorough review of irrigation strategy should be undertaken. The immediate emphasis should be on the completion of the ongoing projects, minor irrigation works, local level water management, planned utilisation of ground water resources and a crash programme for the afforestation of the Western Ghats.

(d) The discussions in the Rural Science Forums and the village studies undertaken by them in 1984 focused on an important aspect of the contemporary agrarian structure of Kerala – the preponderance of land holders who do not depend upon cultivation as the main source of income. According to a rough estimate, around three fourth of the landholders possessing around 30 to 40 per cent of the land area would belong to this category. This phenomenon is due to a number of reasons such as the extreme fragmentation of land ownership, the stricter land ceiling provisions that have forced even larger landholders to accumulate in non-agricultural activities and the 'rurban' nature of Kerala's countryside. It can have significant implication for agricultural productivity. Given the adverse circumstances that have already been detailed and the labour management problems involved in cultivating with hired labour, the inclination of landholders, with cultivation as secondary income, is to shift away from labour intensive crops and to withdraw from intensive cultivation. There is no attempt to maximise production, but they would still hold on to the land in the expectation of speculative profits arising from increasing land prices.

Without consolidating the agricultural operations, especially water management and cropping pattern in the defined watersheds, scientific agriculture is not possible and productivity cannot be increased. For this purpose the Parishat has proposed strengthening of the rural co-operative structure. The novel idea is the creation of a network of co-operatives of poor peasants and agricultural workers in each locality to lease in land for the cultivation of short-term intercrops like vegetables and paddy. Along with it, a package of incentives including fiscal measures should be undertaken to favour more intensive cultivation of the land and to penalise laying land fallow.

Industry

"Industrialise or Perish" was one of the key slogans of the 1st Science Cultural Jatha. However, due to the emphasis given to anti-pollution safeguards, the Parishat has often been attacked for being anti-industry. The Parishat has demanded that an ecological impact report should be prepared and published in connection with each project. It has argued that explanations such as that ecological consciousness is a hindrance to industrialization are as fallacious as high wage cost being a barrier to the industrialisation of Kerala. The argument that people must accept pollution for the sake of industrialisation is as much objectionable as the argument that workers should accept reduction in wages to attract industries. Technological safeguards to abate pollution are available and must be utilised.

The Parishat has attempted to analyse the reasons for the industrial stagnation in the state.[83] Such an enquiry was necessitated by the theories that sought to explain the industrial backwardness of Kerala with reference to trade union militancy and higher wage levels. The Souvenir of 1986 conference sought to answer them by tracing the historical roots of the industrial backwardness of the region, the severe limitations imposed by the deepening economic crisis and the discrimination by the central Government. The study also critically analysed the regional industrialisation efforts bringing out the lack of any regional strategy or planning for industrialisation of Kerala. All decisions are taken purely on an adhoc basis.

A passive policy that is resigned to accepting whatever industrial projects that may come by is not going to accelerate the industrialisation of Kerala. A new aluminium plant (as has been

recommended by a task force of the erstwhile Planning Board) will only accentuate the power crisis in Kerala. A new pulp factory (as was announced by a former minister) will only create more problems for the wood based industries already in the throes of severe raw material shortage. A mechanised coir industry (as is propagated by the Coir Board) will increase unemployment in the coastal areas beyond tolerable limits.... such instances can be multiplied. The Parishath has urged the formulation of an industrial policy that seeks to encourage industries that are based on raw materials abundant in Kerala like rubber, utilise the scarce resources like electrical energy more effectively, have greater employment potential, have greater linkage effects especially to the small scale sector, exploit the vast consumer markets within Kerala and are more ecologically suitable. A significant increase of Central public sector investment, determined effort on the part of the State Government to allocate more resources for industrial development, higher efficiency of the public sector units and pursuit of an active policy which seeks to encourage the type of industries that bring maximum returns to the State are urgently required.

The Parishath attempted a systematic review of the reorganisation schemes being implemented in coir, cashew, handloom and Beedi and the fishery sector in 1987.[84] It is difficult to fully solve the problems of these industries for the simple reason that many of them contain far too many workers than can be usefully employed even under the optimal conditions. Given the severe underemployment already existing in these industries, the Parishath has opposed attempts for mechanisation as in the case of coir industry. At the same time the Parishath has proposed the introduction of certain intermediate technologies that would increase the productivity, and improve the quality of the product without causing large scale displacement of labour. There is also urgent need for the diversification of the products of many of these industries. These changes should be brought about within a co-operative framework so that benefits of increased productivity accrue to workers and effective work sharing arrangements can be implemented. The performance of the co-operative sector has been far from satisfactory but the experience of Dinesh Beedi Co-operative Society raises much expectations. Simultaneously steps also should be adopted for the provision of adequate raw materials at fair price and assurance of wide marketing network for the products of these sectors.

The emphasis on the 'intermediate technologies' in the reorganisation of the traditional industries and in many of the rural development sectors such as domestic energy, shelter etc. has raised the issue of appropriate technological choice. The concept of appropriate technology with its interpretations of being anti-modern, anti-Western etc. has been controversial. At the 15th Annul Conference, an attempt was made to examine the problem from different perspectives.[85] Such theoretical enquiries were not further systematically pursued. The Parishath has tended to take the position that the problem of technological choice cannot be posed in abstract terms. The choice will have to be made on the basis of examination of the concrete conditions and concrete situations.

Another related issue has been the relative emphasis to be given to large and small scale industrial sectors. The Parishath has highlighted the role of the small-scale sector in employment generation and mobilisation of the small capital in the state. But it never has had any doubt on the inevitable and vital ole that the large scale industries would have to play in the industrialisation of the State.[86] The small scale sector, it has been argued, will have to be increasingly developed in ancillary complimentary relationship to the large scale factories. It is precisely such conscious effort that has been lacking in the industrial planning in Kerala.

Energy

Kerala today is a power deficit State. The power cut has once again brought the SVHEP into the limelight. There has been an orchestrated attempt to make out that "the present power crisis in the state was created by the stoppage of the Silent Valley Project in the mid way of its execution."

Forget the fact that the SVHEP was nowhere in the process of real execution, the fact remains that a number of hydel projects which were under construction during the SVHEP controversy and which should have already been commissioned are nowhere near completion even today. In fact, it has been the refusal of the KSEB to consider a thermal plant with a shorter gestation period and more assured supply that has been responsible for the present power crisis.

The preparation of the 'The Wealth of Kerala' had led to the conclusion that Kerala with no known reserves of coal or oil is a highly energy deficient state and that even the full utilisation of all the hydro-energy potential would still leave Kerala with a deficit by the turn of the century. The energy surplus of the mid-seventies was merely an illusion created by the short sighted policies of the KSEB. Rather prophetically, the Parishath had predicted that given the delays in the construction of the hydel projects and the sole reliance on them would create severe power shortage by 1982-83, in case of a monsoon faialure.[87] Unscientific planning and inefficient management have been responsible for the present crisis.

The Parishath proposed the following programme of action to meet the present power crisis : (1) completion of all the ongoing hydel projects on a war footing, (2) the construction of the Salem-Trichur 400 KV line at the earliest and a more rational allocation of power from the Central pool, (3) measures to reduce transmission loss, (4) the creation of a Kerala Thermal Power Corporation and immediate steps for the establishment of a thermal plant to be completed by 1994, (5) establishment of an LSHS based unit, (6) upgradation of the older hydel stations and finally (7) taking up new hydel stations with adequate ecological safeguards.[88]

The KSEB has been insistent that Kerala need go in for thermal energy only after all the hydel sources are exhausted. Given the half-hearted manner in which a thermal station is being pursued today and the attempt made to take up new hydel projects with greater priority will only serve to prolong the power shortage in Kerala. Even the Kayamkulam thermal station proposed to be constructed by the NTPC may get inordinately delayed if the KSEB does not rise to the occasion. Ironically, arguments used by the protagonists of the SVHEP against the thermal alternative that the Parishath proposed during the Silent Valley debate has become handy for certain ecology groups who have come out against the thermal power project.

The Parishath's advocacy of thermal stations has come under heavy attack from such ecology groups.[89] The prominent ones among these groups are a continuation of the pure aecology tendencies that had emerged during the Silent Valley controversy. They argue that the limits of ecologically safe growth have already been reached in Kerala. They demand the closure of energy intensive industries and advocate development of solar and wind energy as alternative sources. The Parishath has been forced to join issue with these groups.[90] These alternative sources, even though important in a long term perspective, cannot make any significant contribution to the immediate requirements.

The KSEB had accorded top priority to an atomic power plant as an alternative source to hydel. Logistical problems involved in the transportation of coal and pollution hazards were the reasons stated for the choice. The Parishath was skeptical about the possibility of setting up nuclear power plants in Kerala, given the high density of population and the interconnected system of waterways. Experience argues for further tightening of safety measures and not relaxing them. The consequence of a major nuclear accident in Kerala can be incredibly disastrous. There is very little advantage in sitting the plant within the political boundaries of Kerala. The Parishath does not oppose the development of India's nuclear energy capability. But it has expressed its reservations about the strategies adopted and directions chosen. The Parishath stands for a sane nuclear power policy.[91]

Electrical power planning is only one element of the total energy problems. The problems of the requirements of domestic energy have always been ignored by the planners. It has been estimated

that the total firewood fuel consumption would come annually to 120-130 lakh tonnes, of which a significant portion is being met by felling of trees in the countryside. Distribution of fuel-efficient chulhas and supply of coal for both domestic and industrial purposes have considerable ecological importance.

The model of high efficiency Chulha developed by the Parishath known ad the 'Parishath Chulha' has proved to be extremely popular.[92] The popularisation of the chulha has become an important activity of the Parishath units. So far 25,000 chulhas have been installed. The popularisation of the chulha is planned as an entry point into the rural household. Installation of chulha on an individual household basis is discouraged. The attempt is to organise it as a collective campaign for a whole locality in which issues regarding domestic energy, energy planning in Kerala and the wider social relations in general are raised. Similarly, the rural shelter and latrine programme are being envisaged as important areas for interventions. The establishment of Integrated Rural Technology Centre at Palaghat has been an important nodal point in the involvement of the Parishat in the development of such rural technologies. The Centre with full time research staff is expected to undertake research in rural energy, biogas, local level water management etc. as well as co-ordinate the Parishath's activities in their dissemination.

With respect to the transport infrastructural sector, the Parishath has emphasised the need to strengthen the water transport systems which have fallen into disuse due to neglect and lack of adequate investment. There is also a strong case for lengthening the railway lines. But the present road mania consequent, on which the allocation for building roads is higher than allocation for industry, is clearly a case of misguided priorities.

Forestry

The main focus of the activities of the KSSP in this sector has been to create consciousness among the people about the importance of the forests and the need to protect them. The state level Jatha in 1983-84 is a typical example of many of such campaigns conducted by the Parishath. The two-week vehicle-Jatha touring all the districts of Kerala was coordinated with Padayatras through the forest belts, collection of signature for a mass memorandum to be submitted to the state legislative assembly, dharnas before the forest offices, seminars and lectures. A conscious attempt was made in the campaigns to link up the demand for the protection of forests with the other development slogans. Thus the jatha of 1987 was called "Forest-Energy-Development Jatha". Hundreds of local level actions, mainly in the nature of exposure of illegal encroachment, logging and transfer of forest land have been organised. The "Munderi March" 1985, in which Parishath volunteers marched at great personal risk, into the forest area where trees were being felled illegally is an action that deserves special mention. All these activities, large and small, have contributed to the creation of a new awareness regarding forests in Kerala.[92]

But this consciousness has remained at the level of a passive concern. There are two major weaknesses that hinder mass agitations on the issue. The first is the failure to involve the people living around the forest areas, who are mostly settlers, in the movement. The second, perhaps even more important, is the failure to evolve a comprehensive and detailed programme for the regeneration and protection of the forests. The Parishath has formulated a broad approach to the problem, the details are yet to be worked out.

The forests in Kerala are to be divided into five contiguous regions. Each region would be further divided into three zones. The inner most zone, is to be preserved as inviolable core forest area. The second zone surrounding the core will be preserved as natural forest which will be exploited scientifically at the rate of its regeneration. The outer most zone is to act as a cushion where

commercial forest may be grown, firewood collection and grazing permitted. The settlers who will have to be removed from the two inner zones may be resettled in the outer zone.[93]

Initially, the Parishath had been closely associated with the social forestry schemes of the state government. Despite the dissatisfaction with the bureaucratic arrangements, the Parishath cooperated in the distribution of saplings. The Parishath also experimented with developing nurseries and distributing sapling independently. In 1986, the Parishath formally disassociated itself from the social forestry programme in Kerala which, by then, had been converted into a World Bank sponsored programme. The Parishath published a detailed critique of the scheme.[94] The implementation of the scheme, it was pointed out, would be disastrous for the natural forests of Kerala. The matching grant of the Kerala government was largely to be met from the slender resources allotted to the forest department. A state-wide users' survey conducted by the Parishath proved that (a) the estimate of demand for the saplings was grossly exaggerated and (b) unlike what was stated in the scheme, the preference of the people was for the native fruit tree saplings. The Parishath also questioned the advisability of introducing alien varieties of trees on such a massive scale as was envisaged in the project. The scheme has become a by word for corruption.

The Parishath has not been active in the other primary sectors of the economy such as fisheries and animal husbandry. Problems of fishermen have been raised in the science jathas. The Parishath has extended support to the struggles of the traditional fishermen against the ecologically disastrous mechanised trawling practices. The sharp declines in the fish catch along the Kerala Coast points to a major ecological disaster in the making.

Local Level Planning

A people's science movement can only draw up broad policy approaches. It cannot undertake the job of a planning authority. Various factors have severely constrained the effectiveness of planning process in our country. Little can be expected from the bureaucratic development apparatus. One way to break out of the present administrative impasse is to decentralise the planning process to district and panchayat levels. Only such a measure can ensure the effective participation of the people and make the planning process more responsive to the felt needs of the people. All local development projects below a certain amount should be left to the sole discretion of the panchayats. The government departmental agencies operating at village level should work in close co-ordination with the panchayats. The people's science movements like the Parishath can play a useful role in such a decentralized set-up. The Rural Science Forum, in one sense, was a bold experiment in local level planning. After the panchayat elections in 1979, the Parishath on the basis of a special approach document, attempted to initiate village level discussions on development progammes involving the newly elected representatives and concerned people in the village.[95] All these attempts, it must be pointed out, met with only limited success. With Parishath units today functional in all panchayats and from the experience gained in the past intervention, a new concerted effort is being made to involve the Parishath units in local development activities.

VII
EDUCATION AND COMMUNICATION

Two development sectors in which the Parishath has been active not only in evolving theoretical critiques and formulating alternatives but also practically involved in experiments for reforms have been education and health sectors. In a broad sense the KSSP may be described as a movement for mass education. We shall be dealing mainly with the activities related to the sphere of formal education in this section. The activities in this sector may be divided into three broad types:

a) Make learning and teaching an interesting and useful experience.

b) Formulation of a meaningful education policy and curriculum and

c) Agitations against corruption, privatisation and commercialisation of the educational sector.

In the Schools

We have already noted the entry of the Parishath into the school system and its varied activities: utilisation of science clubs, utilisation of science Kits, science talent tests, pre-taste courses, journals for school children and so on. The science clubs and science fairs are organised today directly by the Education Department with the co-operation of the Parishath, while the Department extends its facilities to the Parishath for the conduct of the tests. The prestige that has come to be associated with the tests produced certain undesirable effects: Institutions have been started to 'coach' the students for the tests and commercial publishers have started to bring out the 'guides'. Therefore, in recent years, there has been a conscious attempt to play down the competitive aspect, decentralise the programme, inject greater festive and game spirit and reform the techniques of examination.

The *Sastragathi* examinations for the college students do not make use of the traditional examination techniques at all. Each student has to answer two hundred questions, within a stipulated period of time. But the questions are so set that they will have to consult a large number of books and specialists in different disciplines to answer them correctly. However, the number of students who participate in the college level examinations comes to only a few hundreds. In fact, the college level activities of the Parishath have not been satisfactory. *Sastragathi Science Forums* have yet to be organised in a majority of the colleges. The major reason for this relative lack of success is the failure to evolve an appropriate package of programmes for the university students' level activities and proper follow up measures.

An important intervention in the formal education sector has been the programmes for teacher's training. The Parishath closely associates, to the extent possible, with the programmes of retraining conducted by the official agencies. It also organises state and regional level independent programmes. A number of resource personnel have been trained and special notes prepared for many subjects.

Outside the Schools

One limitation of the activities within the schools system is that its success to a great extent depends upon the co-operation of the educational authorities and school managements. Therefore there has also been a conscious attempt to organise programmes for the school children outside the formal school structure. Such activities have been rapidly expanding. A nodal point in this shift was the organisation of the *Eureka Balavedy and Sastra Keralam Clubs* in 1978-79. Initially most of these children's clubs were organised around schools. In 1980-81 the slogan was raised 'to move the children's clubs out of the class rooms'. A handbook for the purpose of outlining a variety of activities that can be organised at local levels played a useful role in the process.[96] A Parishath style of organising activities for children where they are educated through fun and frolic began to slowly evolve. Today there are more than thousand children's clubs affiliated to the Parishath. The clubs organise a variety of continuous and regular local level activities such as nature watching, crafts, hobbies, games and so on. It is around these clubs, rather than the schools, that the main activities of the Parishath for children have evolved in the recent years.

Of these activities two deserve special mention: camps and puppetry jathas for children. There are broadly two types of camps that are being organised today: 'Balotsav camps' and "study camps". As the name itself implies the emphasis of the former type is on negating the boredom of the formal class rooms. The camps are structured around 'corners' under 'corner chiefs' dealing with a variety of topics such as music, drawing, hobbies, story telling, theatre, mathematics for fun, magic

of chemistry and so on. Such camps are organised at all levels starting from the units. Recently an All India Balotsav camp with more than one thousand children participating (more than 300 children from 11 states other than Kerala) was also organised.[97] A systematic critical review of the pedagogical techniques that have evolved through these camps is being attempted.

In the 'study camps' the focus is the school curriculum itself. But there is a world of difference between the Parishath's camps and the boredom of the class rooms. The most recent educational experiment in this direction has been the "Living with Science" camps organised during April-May 1987 involving about 5000 children and 1000 teachers.[98] This is an experiment in integrated science teaching and also to train teachers to impart the "joy of learning" to the students. The lunch on the first day of the camps cooked on the Parishath stove with the participation of the students constituted the nodal point from which classes on physics, chemistry, nutrition, economics, etc. branched off. A draft text on 'integrated science' based on the eighth standard syllabus is partly an outcome of these camps.

The Balotsov Jathas is a very recent innovation. It consists of a group of artists who tour the state performing at various schools puppet shows, short plays and songs based on the lessons taught at schools. It has proved to be extremely popular. In 1988 three such Jathas were organised simultaneously.

The Parishath has also been active, to an extent, in an aea that has been largely neglected-the pre-primary schools. Numerous state level and regional camps for pre-primary teachers have been organised. A book on "Education Before the Age of Five' has also been published.[99] This continues to be an area where much more systematic work has to be undertaken.

Document on Education

"However, while carrying through the above activities it became obvious that much more serious thought has to be put into the structural and conceptual framework of education..... it became necessary to evolve an educational policy and meaningful curriculum and organise agitations against anti-people policies..."[100] 'A Document on Education' was discussed and finalised at the 19th Annual conference at Mancheri in 1982.[101] It remains the basic approach document of the Parishath on education and the subject of numerous seminars, discussions and lectures organised throughout the State.

The Document after a fairly detailed discussion of the social function of education and the purpose it should ideally serve undertook a critical analysis of the present educational system; its elite bias, medium of instruction, alienation it produces from productive labour, the irrelevance of the curriculum, unscientific teaching methods that destroy all inquisitiveness of the students, lack of proper educational facilities, outmoded examination system, the pernicious influence of caste and religious interests and the anti-people educational policies.

On the basis of the above critique the Document attempted to develop a methodology for a relevant curriculum. It also attempted to present an alternative educational structure the salient features of which were the emphasis on a self-sufficient school stage, self-sufficient +2 stage with emphasis on vocational training, dovetailing of the general educational stream to vocational courses at every stage, mobility between various stream through short term courses, specialisation and research in the universities, autonomy to the educational sector and academic councils at school, district and state levels.

The teaching methods have to be thoroughly overhauled and the mother tongue is to be the medium of instruction. There were detailed proposals for examination reforms. Examination for sieving had to be separated from examinations as aid to teaching. The latter types are to be conducted internally by the teachers themselves. Only grading system at the most is to be used at the terminal

examinations. Separate entrance examination for all courses and tests for employment are to be conducted.

The Parishath understands the elite nature of the education and the difficulties involved in the partial reforms. But it does not accept that nothing can be done or need to be done in the present socio-economic set up. It views education as an area of struggle. It can also be a tool for social change. "We should therefore examine the means to use the present day education itself, its structure, contents, teachers, schools etc. to change itself and the society."[102] This in nutshell constitutes the approach of the Parishath to agitations in the area of education.

Agitations

The period from the end of the seventies witnessed very dangerous trends and shifts in government policies in the educational sector in Kerala. A conscious effort to promote the private sector, the spread of unaided elite private schools, promotion of anti-secular language policy - Arabic in 'Muslim' schools and Sanskrit in 'Hindu' schools as compensation, a marked increase in corruption, virtual breakdown of the university examination machinery, misdirected priorities in opening new universities and colleges, and encroachment into university autonomy. A united movement involving teachers, students and educationists developed against these policies. The Parishath has been actively participating in these agitations. The Parishath's distinctive contribution in these agitations have been the thousands of classes it organised on education, the initiative it took in organising the 'school protection samities' of parents and teachers around schools in each locality, and the Education Enquiry Commission headed by C.Achutha Menon that toured the districts to document the rampant corruption and an educational institutional survey.[103]

The Parishath has been involved in the adult education programmes.[104] In 1978-79 it attempted to organise 100 centers for adult literacy classes. Like the fate of the programme in general, the efforts of the Parishat have, also not been very successful. Another attempt was made to develop a model project in Malappuram district in 1986. The experience points to the peculiar difficulties in organising adult literacy programme in Kerala with a high level of literacy. The eradication of the illiteracy at the margin would involve disproportionately high effort. The eradication of illiteracy can be achieved only by making it a national campaign involving the various mass organisations in the state and generating a national wave of enthusiasm. The Parishath has expressed its commitment to co-operate whole heartedly in such a programme.

Communication: The printed and spoken word

The popularisation of science, in a sense, is a problem of communication. There are different media for communication. 'Sahithya', the written word, is only one among them. In the early years of the Parishath, the written word was the main medium of communication. Despite the effective development of the other media of communication during the subsequent period, the importance of journals and books has not diminished.

The Parishath today publishes three popular journals in Malayalam each for a specific age and target group with a total circulation exceeding 75,000. There is also a separate 'Parishat News' catering to the organisational requirements. A journal in English *Science for Social Revolution* is expected to commence publication with the Silver Jubilee Conference.

We have noted the circumstances under which the Parishath hesitatingly entered the area of book publication. It has expanded into a major activity and the main source of financial resources of the movement. Today it publishes books worth Rs.40 lakhs annually. The books published by the Parishath may be divided into two types. The first is what may b described as the 'passive group' like children's books, popular books for adults, and reference books. These books are published without

any specific or defined programme of use. They are general science books covering a variety of topics. At times, they are published in sets. The most prestigious of these has been the set of 50 books called 'Science Cream'. The second types of books belong to the 'active group'. They are prepared with a specific objective in view. They include the various propaganda books and pamphlets, study and research reports and the semi text books prepared for the science talent tests, the lecture campaigns etc.[105]

It was during the latter half of the seventies that the spoken word as a medium of communication came into prominence. Lecture campaigns have been a regular programme of the Parishath. 8,000 classes were conducted in 1985 based on the book "The World We Live In'. The 10,000 lectures on astronomy in connection with the arrival of Halley's comet 1986 also deserves special mention.[106] The 'Science Parliament' where a panel of experts answer the questions raised by the public, on selected topics, has been another successful innovation.

Audio-visual methods such as models, drawings, slides, video and films have also been used in the campaigns. The slides have been widely used as an aid to popular lectures. The 'Sastra Kala Jathas' are the products of a conscious attempt to use the medium of performing arts to communicate science. We have already noted the evolution of the science Jathas. The 'Jatha' form of communication was borrowed from the socio-political movements. And initially, the spoken word continued to be the medium of communication of the Jathas. In the 'Science Jatha of 1977, the first of the numerous musical slogans of the Parishath evolved. School children spontaneously responded to the slogans of the marchers and by the time the jatha ended the musical chant of *'Sastra Geetham'* had evolved.

The local level experiments with folk art media for science communication and the experience of the theatre group Samudaya in Karnataka were responsible for the introduction of the performing arts into the Science Jatha. Thus was born the Sastra Kala Jatha.[107]

Both the content and the form of the 'sastra kala' have been collective creations. The preliminary scripts prepared by individuals, on the basis of collective discussions, usually get modified thoroughly during production. So far, around 120 scripts have been finalised, produced and performed. Some of them have gone through more than a thousand performances. The total repertory may come to around 30 hours. Forms are varied, ranging from regular short plays and group songs to musicals and a variety of folk art forms. All the artistes and script writers are KSSP activists, and every year, a new set of activists are trained. Today every district has its own separate art troupe.

The experience of the Parishath is that the 'Sastra Kala Jatha' to be effective, has to be part of a series of activities. It is difficult to communicate new ideas through such short performances. It is effective in communicating ideas that are already a part of a wider campaign. It gives an emotional support to an intellectual argument.

VIII
THE PEOPLES HEALTH MOVEMENT

KSSP's intervention in the health sector belongs to a relatively more recent period. But for the publication of a few articles on health, nothing noteworthy was done in this area till the late 1970s. The health classes of 1977 were the beginning. Starting from the propagation of simple public health messages among the rural people, the Parishat, by its various activities spanning over a decade, has already initiated what is described as People's Health Movement in the State. The Parishath was able bring into its fold a number of doctors, medical students and members of the paramedical staff not only from modern medicine but also from other systems of medicine like Ayurveda, Homoeopathy, etc. There are KSSP units in all medical colleges (modern, ayurveda as well as

homoeopathic). Next to teachers, doctors form the single largest professional group in the Parishath. Health has also been an area where there has been active exchange of ideas with other groups like the Medico Friend Circle and FMRAI in India and also with other groups abroad such as Gonoshasthrya Kendra, Bangla Desh.

The KSSP shares with many other health activists groups in India a strong critique of the health delivery systems in the country.[108] Even after 40 years of independence, the poverty diseases are still rampant. But surprisingly, the numbers of sophisticated hospitals are on the increase. Every year about 12,000 doctors are trained in our country. The contradiction between an expanding health delivery system and the continuance of rather pitiable health condition of our people is very glaring. There is a disproportionate concentration of doctors, and in the urban centers the traditional systems of medicine are often neglected and face the fate of virtual extinction.

The content of the medical education has little relevance to the health needs of the majority of our people. The colonial system of medical education is still religiously followed. Preventive aspects of medical care and community medicine are not given priority. On the other hand, the medical education and the health delivery system is totally curative oriented. Medical care therefore is individualised, institutionalised and out of reach of the majority of the people.

The drug industry is largely controlled by the foreign multinational companies. These companies produce about 60,000 formulations, though it is widely accepted that about 250 drugs can take care of most of the health needs of the country. The market is flooded with useless and hazardous drugs. Drug companies are not interested in producing the essential drugs.

People's health: Certain ideological issues

Parishath holds that this state of affairs can change only through intervention of the people at various levels of the health delivery system. Health is the fundamental right of the people. It is the duty of the State to create the necessary conditions for the attainment of the health for all in the country. People can as a matter of right struggle for better health. The role of medical profession in improving the health status of the people is only secondary. The primary factor is the socio-economic conditions of the people. The social determinants of the health are again and again stressed by the health activists in all their campaigns. To simplify this Parishath activists often say that the present tendency to equate health with disease, doctor, hospital and drug should change. Instead, food, safe drinking water, sanitation, employment, education and housing should be equated with health. The new equation directly links the health question to the general social question and the general struggles for social transformation.

The Parishath stands for a healthy integration of the different systems of medicine, it does not cater to the view that modern medicine is the only scientific branch of medicine. On the other hand, Parishath also does not agree with the suggestion that modern medicine in toto is an alien science and we should only depend upon the traditional systems. There are unscientific and anti-people tendencies in all the systems of medicine in a class society. It is the duty of the People's Health Movement activists to expose these tendencies. As a result of these struggles, the healthy integration of the different systems should evolve.

It is obvious that the modern medicine is facing a severe crisis in most of the developed capitalist countries. Reacting to it, sociologists like Ivan Illich reject the modern medicine and call for individual autonomy in meeting the health problems. Parishat has adopted a critical attitude. The weaknesses of such trends lie in the failure to carefully examine the political and economic reasons for the crisis. They propagate an anti-technology and victim blaming ideology and finally end up in mere life style politics. The Parishath feels that such attitudes are not only apolitical but also unscientific.[109]

There are health groups who feel that, attempts to reform the present health care system are futile exercises. Instead, alternate people's health centers should be formed by the people themselves. While approaching such attempts as part of the fight against the present health delivery system, the Parishath has cautioned that it should not absolve the State of the responsibility to impart health to the people.

Health Campaigns

Based on the above premises, the Parishath is carrying out an ideological and practical struggle for the creation of a People's Health Movement in the country. The Parishath is regularly organising a number of health education classes meant mainly for the rural people. Subjects like disease prevention, nutrition, immunisations, first aid, oral re-hydration therapy etc. are covered. In 1985 the Parishath organised thousands of classes on People's Health. A book 'Peoples Health' (Janakeeya Arogyam) was published as part of this campaign. Thousands of copes of the book were sold out within a few weeks time.

The Parishath has taken a lead to form 'Hospital Protection Samities' in many parts of Kerala. The Samities are peoples vigilance committees to improve the health are facilities of the government hospitals. Organisations of curative medical camps are very much in vogue in Kerala. Instead KSSP organises preventive medical Camps for mass immunisation and health education.

A major campaign by the KSSP was on the drug issue. A number of meetings, jathas etc. were organised to expose the unethical marketing practices of the drug industry. The non implementation of the Hath Committee recommendation was stressed. The concept of essential drugs was popularised. Of the numerous books published by the Parishat, the most popular has been the one on 'Banned, Bannable and Essential Drugs'.[110] 35,000 copies of the book has been sold. A companion volume 'Drug Information Packet[111] for those in the medical profession was also published.

Parishath has also examined the specific health problems of the people of Kerala. The mortality rate is very low in Kerala as compared to that of other States. Also the life expectancy is high. However, poverty diseases along with the so-called diseases of affluence are rampant in Kerala. Therefore Kerala faces a peculiar situation which is known as "Low Mortality High Morbidity Syndrome". However there is no reliable statistics available regarding the morbidity pattern in Kerala. The high morbidity is to be examined in detail. To develop a deeper understanding of the linkage between the socio-economic factors and the problems of health, the KSSP has recently conducted a large-scale health survey in Kerala.[112]

The conduct of the Survey was utilised as an occasion to educate the Parishath activists on specific health problems of Kerala and to intensity the public campaign on general health issues. A series of Health camps extending over a month was organised in all Panchayats in Kerala. The Health camps consisted of (a) a minimum of six classes on nutrition, immunisation, oral re-hydration therapy, first aid, health habits and blood donation, (b) immunisation camps for children under five and antenatal mothers, (c) film shows, slide rogrammes and poster exhibitions, (d) health jathas and (e) medical parliaments. The survey was conducted in every panchayat by a team of Parishath workers who were specially trained for the purpose. The data is now being processed and when completed will provide the factual basis for the formulation of a 'Health Policy for Kerala'.

Against Multinational Monopolies

As part of the drug campaign Parishad entered into a new area - the operations of the MNCs in the Third World countries. The question of dumping of hazardous drugs, pesticides, polluting industries etc. came to the forefront. It was in this context that the question of self reliance was raised by the Parishath. Various studies including that of the Hathi Committee and UNIDO have

shown that India has the technological capability to produce all the essential drugs. However, even after 40 years of independence, the MNCs are still controlling the drug industry. Moreover, these companies are not interested in producing essential drugs but often market in India hazardous drugs banned in their countries.

The campaign against the MNCs intensified with the Bhopal Industrial disaster.[113] The Parishath called for the boycott of the products of the Union Carbide. It gave a practical slogan to the campaign against the callousness of the MNC and the demand for adequate compensation to the victims. A systematic exposure of the international operations of the Union Carbide and its industrial safety and ecological record was made. The experience taught the Parishath of the importance of concretising the campaigns against MNCs through taking up specific companies, and products linked with the life experience of the people. The campaign against the attempt of Organon to market certain specific dangerous drugs in Kerala is another instance that is relevant in this context. The example of Dr.Olle Hanson in fighting and defeating a multinational giant like Ciba Giegy was highlighted to inspire confidence among the people.

The connection of the MNCs to the military-industrial complex in the West was also an element of the campaigns. Therefore when the peace campaigns were taken up in a major way, the link between imperialism and the threat of war was self evident to the movement.[114] The indictment of the positions adopted by the USA on disarmament in the peace campaign was a logical continuation of the campaign against the multinational monopolies. The campaign against militarisation of science and for peace has become a important theme in the Kala Jathas and books. The book 'Fore well to Wars was the textbook for the science talent test for the year 1987.[115]

IX
WOMEN AND SCIENCE

A major weakness of the People's Science Movement in Kerala has been the low number of women activists in the movement. The movement has been acutely aware of this weakness as revealed by many of its self-critical assessments. A number of counter-measures were consciously adopted at various time points. It included the reaction of a State level separate sub-committee of women as well as separate 'women's forums' at unit level. Certain types of activities like organisation of children's clubs were also stressed as important areas that could attract women activists. The slow progress in this direction initiated serious debate within the organisation on the women's question. The initiative for this discussion came from the women activists themselves. A detailed document 'The Parishath and the Woman Question' was drawn-up through a series of workshops organised in 1987.[116]

The document noted that the low participation of women in social movements is not an issue peculiar to the parishath. It is a more general phenomenon which can be understood only through an in-depth study of the socio-economic structures that maintain the relations of male dominance. For women in Kerala the mobility, apart from going for the outside job, is severely limited by social norms. In addition the double burden of housework and outside employment restricts the scope for women not only to attend meetings but also to undertake serious studies. The KSSP has found that the interest of girl students in 'science clubs' and science camps is no less than that of boy students but beyond the school level there is a sharp decline. Those few women activists, who have emerged, in fact, make super human efforts to fulfill all their obligations.

But the KSSP has not limited its analysis to the ultimate solution of social oppression but has also begun to self-critically examine if its various activities have fully taken into account the needs

of women. It implied a debate on what is meant by 'scientific temper', an examination of the neutrality of science and its methodology and an attempt to integrate some of the experiences of women's health movement.

The document points out that what is required is not a separate forum for women within the Parishath or selection of specific areas of activity (with the attendant gender biases) but the need to raise the gender issue in every area of activity that Parishath is involved in and formulate slogans that are more specifically related to the problems of women in each of these areas. The whole movement, not women alone, will shoulder the task of campaigning for these demands.

Within the health movement, conscious attempts have been made to take up issues relevant to women such as the contraceptive technology, gender biases in the health care system, drugs specifically harmful to women, the gender biases in the family planning programmes and so on. More over, rural health classes for women giving special attention to the reproductive system and the aspects of 'being' in relation to their reproductive system are to be taken up.

On the education front, there is need for a systematic enquiry into the gender bias both in the school curriculum and school textbooks. Even though sensationalisation of women in the media has been taken up in the Kalajathas, there is a need for systematic analysis of the portrayal of women in the Malayalam media. Violence against women and the problems of dowry are on the increase in Kerala. Literacy can be a double edged weapon.

Critiques of the development process normally do not include the impact of this process on women. The development process in our country, it is now recognised, has had specifically negative implications for women with declining employment opportunities and also access to resources such as fuel and water. Government programme have largely neglected women's interests – this is highlighted if we note that women account for a very low proportion of the beneficiaries.

Re-orientation of the movement on the above lines would require deep study and understanding of the various processes from a gender perspective. Consequently the immediate programme of action on the woman's front drawn up by the Parishath lays great emphasis on self-study structured around a series of workshops to be conducted in the coming years.

X
SCIENCE FOR SOCIAL REVOLUTION

We have attempted to analyse how from a group of science writers who were mainly concerned with their semi-professional problems, the Kerala Sastra Sahitya Parishath has evolved into a mass movement of the people involved in a wide spectrum of science based activities. Today the KSSP has more than thirty thousand members and many times more sympathisers spread over more than one thousand units covering all the rural panchayats and urban centers of the State. Nearly half a million children actively participate in its educational activities. It reaches out annually to many more millions of people through its mass education programmes on science, health, education, ecology and development, utilising a variety of mass communication media. All these have had a perceptible impact on Kerala society as can be gauged from indicators such as the expansion science readership and publications, the debates on and awareness of ecology, harmful drugs, pollution, deforestation and so on.

The experience of KSSP has shown the viability of a People's Science Movement. The science based activities have an important role to play in preparing the ground for social revolution. The space so defined can be a common platform for all social activists, whatever be the differences

among them regarding the precise nature of the social revolution and irrespective of their affiliation to particular political parties or lack of any such association. The KSSP reveals the organisational possibility of such a broad based science movement. The experience of the KSSP also reveals the key elements of a programme for such a science movement of the people. We had attempted to bring out this aspect through an analysis of the evolution of the content of the slogan 'Science for Social Revolution'. We shall attempt to sum them up below:

1. *Popularisation of Science*

The scientists, science writers and social reformers who took the lead to organise science groups at the end of the 50s and the early 60s in Kerala were participating in a great democratic task, the popularisation of science and creation of a scientific temperament among the people, which has a vital role in the struggle against the outmoded structures, traditions and superstitions of the past. The spread of science can play a great liberating role in a semi-feudal society such as ours.

2. ***Struggle against abuses of science and anti-people ideology***

The development of science and technology is not taking place in a vacuum, but within society. And ours is a class polarised society. Science and technology today are used in the service of a minority for their enrichment. The result is that the vast majority face the threat of immiserisation. It is the duty of the People's Science Movement to come to the defence of the people against the blatant abuses of science and attempt to ameliorate at least some of the negative consequences of the technological changes. Over the last one decade, the KSSP has led numerous local and state-wide agitational campaigns against misguided development schemes, such as the Silent Valley hydroelectric scheme, Factory pollution, occupational health hazards, and harmful drugs, militarization of science and threat of nuclear war.

3. ***Formulation of people's alternatives***

The experience in these campaigns has shown the importance of formulating alternative solutions to the problems, if the unity in struggle of different sections of the people is to be ensured. Such alternatives are possible and feasible. In a profit-oriented society such as ours, the official solutions rarely are socially or, at times, even technically the optimal ones. The interaction of socially committed scientists with the people has enabled the KSSP to formulate alternative policies which are more in the interest of the people and the long run development of the State. It is also an important task of the movement to expose the anti-people ideological interpretations of scientific theories.

4. ***Struggle for a self-reliant scientific and technological capability for the nation***

The involvement in the campaigns against abuses of science, particularly those related to drug abuses and environmental disasters as in Bhopal, has made one acutely aware of the role played by multinational monopolies in distorting and thwarting the development of science and technology in our country. A People's Science Movement in a developing country like ours can ignore only at its peril the threat of imperialism. Mobilising popular support for the development of a self-reliant science and technological capability thus has become yet another important element of the campaigns.

5. ***Rendering technical and scientific aid to the other people's movementas***

The KSSP has always considered itself not as an alternative but as complementary to the other mass organisations of the people. It is important for the science movements to enter into a dialogue with the other people's movements, as a part of their broad task to develop scientific outlook in society and also to learn from their experiences. It is impossible to create a scientific outlook in society without taking science to the varied organisations of the people.

These constitute the essence of the programmatic understanding that has been sought to be captured by the slogan 'Science for Social Revolution'. There have been explanations that the Parishat's

experience is a response to the unique circumstances of Kerala and the conditions in the other parts of India are different. It is not difficult to see that the basic social reality and the social transformation that has to take place are fundamentally the same despite many differences in detail. And that is the relevance of the slogan, 'Science for Social Revolution' for the emerging people's science movements in India.

Notes and References

1. P.T. Bhaskara Panicker, *Adya Kalam* (Mal.), Unpublished Manuscript, 1982.
2. K.G. Adiyodi, 'Kerala Sastra Sahitya Parishathinte Jananam' in K.I. Vasu et al. (ed) *Sastra Sahitya Prasthanam*, STEPS, 1982 p. 212.
3. M.P. Parameswaran, *Sastra Sahitya Parishat (Mal.) Bombay, (Mal.)* Unpublished Manuscript, 1982.
4. For a description of the history of *science literature* in Malayalam, see K.I. Vasu et al. (ed.) op.cit.
5. P.K. Michael Tharakan, 'Socio-Economic Factors in Educational Development: *Case of 19th Century Travancore Working paper* 190, CDS, Trivandrum 1984.
6. N.V. Krishna Warrier, 'Malayala Sahityathinte Abhivridhikku Oru Panchavalsara Paddhathi' in *Pariprekshyam*, SPCS, Kottayam, 1980 pp.48-60
7. K.G. Adiyodi, 'Sastra Sahityakarananmarkku Oru Sanghatana' *Sastra Sahitya Parishat Ulghatana Smarakam,* 1962, p.9.
8. For a more detailed discussion, see T.M. Thomas Isaac and P.K. Michael Tharakan, 'Sree Narayana Movement in Travancore 1888-1939; A Study of Social Basis and Ideologial Reproduction' *Working Paper* 214, CDS, Trivandum, 1985.
9. K. Ayyappan, 'Science Dasakam' in '*Sahodarante Padyakrithikal'* D,C. Books, Kottayam, 1981, pp. 115-116
10. K.G. Adiyhodi, 'op. cit.,' p.10
11. K.K. Rahulan, 'Bangalorile, Sastra Sahitya Sammelanam', '*Sastragathi*', No.25, Sept-Oct. 1972. See also, B. Bavamdar 'Malayala Sastra Sahityam Bangaloril', T.R. Sesha Iyengar, 'Malayala Sastra Sahityam Bombayil'; and K.M.Govi, 'Sastra Sahitya Parishat, Calcutta', 'Sastra Sahitya Parishat Souvenir 1968, KSSP, Trivandrum, p.p.77-81.
12. 'Pathradhipa Kuripu', '*Sastragathi*' No.1, Oct. 1966, p.4
13. Mani, 'Malayalam Sastra Sahityathinte Purogathiyil Oru Nazhikakallu', 'Sastragathi', No. 4, Feb. 1968, pp. 71-89
14. Anon, 'Malayalathinu Oru Sankethika Sabdavali, 'Sastragathi', No. 4, Feb. 1968; V.R. Govindanunni (ed). 'Malayala Sastra Sahityam Parichayakosam' STEPS, Trivandrum, 1972; and M.N. Subramaniyan, 'Sastra Grantha Soochi', Serialised in 'Sastragathi9' No. 21 to 25.
15. Anon, 'Bharana Bhashakku Venti Laksham Oppum Octobaril Oru Jathayum', 'Sastragathi' No. 44, June 1975, pp.5-6
16. Anon, 'Language Institutinteyum Parishathinteyum Samyukthabhimukyathil Symposeum' 'Sastragathi' No. 7, Jan. 1969 pp. 113-115.
17. V.K. Damodaran, 'Thirunju Nockumpol', 'Sastragathi', No.19, Sept-Oct. 1971, p.7.
18. M.P. Parameswaran, 'Kodungattu Pole Munnottu' 'Smaranaika 1976' KSSP Cannanore, 1976, p.12
19. M.P. Parameswaran, '*Kerala Sastra Sahitya Parishad – A Movement for Mass Education,* (mimeo), Trivandrum 1984, p.16 and P.T. Bhaskara Panicker, V.K. Damaodaran 'Karuthu, Kootuthal Karuthu' '*Smaranaika 1976* KSSP, Cannanore, 1976, p.12.
20. C.G. Santhakumar, '*Jana Madhyathilekku'* in Ibid, p.18

21. Ibid, p.17
22. *Irupatham Varshika Souvenir*, KSSP, Trivandrum, 1982, pp 48-49, 22.
23. *Kerala Sastra Sahitya Parishat – A People's Science Movement*, KSSP, Trivandrum, undated, p.5-6.
24. C.G. Santhakumar, op.cit., p.16, Anon, 'Aayirum Grama Sastra Samithikal', *Sastragathi* No.59, 1976, pp. 47-48 and *Grama Padanam-Pradhamika Sameepanam*, KSSP , Trivandrum, 1984, pp.1-2
25. In 1969 there were district committees in only 4 districts. By 1972 district commitees had come up in all the districts. Later, another additional organisational tier-area committees – were introduced between the District committees – and the units.
26. Pravarthaka Pariseelana Rekha 1981, KSSP, Tricandrum, 1981, pp.9-10
27. Irupatham Varshika Souvenir, p.35
28. M.P. Parameswaran, 'People Science Movement', Paper presented at the 17th Interdisciplinary Research Methodology Workshop on Science, Society and Technological transformation, Hyderabad, 1987, p.7
29. *Pravarthaka Pariseelana Rekha* 1981, p.99
30. See Robert E. Fylner, 'The Social Relations of Science Movement (SRS) and JBS Haldane' Science and Society Vol. XLI, No.3, Fall, 1977.
31. M.N. Subramaniyan, 'Sastra Symposiangal' K.I. Vasu et al. (ed). Op.cit., p.220.
32. See the Bibliography to Prakruti, Samooham, Sastram, KSSP, Trivandrum, 1976, pp.63-67
33. Kerala Sastra Sahitya Parishat A People's Science Movement p.6
34. See for example 'Sastra Sahitya Parishath – Sugar Coated Poison' the circular of Joseph G. Fernandez, Bishop of Quilon dt: 11.7.1987: 'Many parents, teachers and even many sisters and priests are unaware of the hidden danger. They should realise it. It is decided that we should not allow this movement to enter our schools or parishes. Do not send chaildren for any programme organised by them. Do not give school buildings for any of their activities....." ORA – a radical Christian journal took lead to mobilise public opinion against the "circular from the bishop who is trying to cast darkness at noon' ORA, Vol.5, No.4, August 1987.
35. Pravarthaka Pariseelana Rekha 1981, pp.10-11
36. *Ibid* p.13.
37. Communist Party of India (Marxist), Report on organisation, New Delhi 1979, p.15.
38. Pravarthaka Pariseelana Rekha 1982, KSSP, Trivandrum, 1982, p.28.
39. *Ibid.* p.
40. Kuttnadinte Prasnangal: Pathana Report, KSSP, Trivandrum, 1978
41. Kerala Sastra Sahitya Parishat – A Peoples Science Movement p.11
42. M.K. Prasad in 'Environment and Development: KSSP's Approach' Science as Social Activism, KSSP, Trivandum, 1984.
43. V.K. Damodaran (ed.) The Story of a Dying Village: A case Study of Pollution Problems, Science Communicators Organisation, Calicut, 1981
44. Kalladayar, KSSP, Trivandrum, 1983; Moovattupuzha, KSSP, Trivandrum, 1983; Chaliyar, KSSP, Trivandrum, 1983 and Moovattupuzha Parisara Malineekaranam, KSSP, Trivandrum, 1985.
45. Zfar Futehally Report of the Task Force for Ecological Planning for the Western Ghats, NCEPC, New Delhi, 1977.
46. M.K. Prasad, et al. The Silent Valley Hydroelectric Project A Techno Economic and Socio Political Assessment (Mimeo), KSSP, Trivandrum, 1979

47. Kerala Forest Research Institute, 'Impact of Hydroelectric Projects on Wildlife: Report of the First phase of Study, KFRI, Peechi, 1977; 'workshop on an Expedition to the Silent Valley. New Amarambalama Reserve Forests of Kerala', Geological Survey of India, Hyderabad, 1970; R.S. Pillai, 'Fauna of Silent Valley
48. M.K. Prasad, et al; 'o.cit'. pp. 18-19
49. *Ibid* p.38
50. *Ibid* p.38
51. For a description of the campaigns see V.K. Damodaran, 'Silent Valley: A Look Back', Deem New Delhi, 1987 and Darryl D'Monte 'Temples or Tombs', Centre for Science and Environment, New Delhi, 1985, pp. 29-61. See also, 'Silent Valley Charcha', KSSP , Trivandrum, 1980 , and 'Silent Valley Padhathi – Parishathinte Nilapadum Visadeekaranavum' KSSP, Trivandrum, 1980.
52. C.K. Kochukoshy, 'Silent Valley: Facts and Fiction', KSEB, Trivandrum, 1982; B.K. Nayar, 'Silent Valley: An Ecological Hyperpole', PASS, Trivandrum, 1980; K. Raghavan Nambiar, 'Silent Valley Project: An Analysis', PASS, Trivandrum, 1980; M. Stephen 'Ecology of the Fauna of Silent Valley', KSEB, Trivandrum; K. Vijaya Chandran, 'Silent Valley: Myth and Reality', PASS, Trivandrum; and E. Balanandan, 'Silent Valley: Ecological and Environmental Protection', PASS, 1980, Trivandrum.
53. The new organization was ironically named the 'Parisara Asoothrana Samrakshana Samity' (PASS) or Society for the Protection and Planning of the Environment.
54. M.G.K. Menon, 'Report of the Joint Committee on the Silent Valley Hydel Power Project' (Typescript), New Delhi, 1983, p.4
55. Silent Valley Project. An Analysis of Dr. Nambiars Argument' Environment Health Brigade of Kerala Sastra Sahitya Parishath, Calicut, 1977, pp.6-7
56. 'Silent Valley Jala Vaidyutha Padhathi, KSEB, Trivandrum, undated, p.8.
57. M.G.K. Menon, 'op.cit'. p. 4
58. 'Ibid', p.3
59. Resolution passed in the Executive Committee of Kerala Sastra Sahitya Parishad on 15th October, 1978 in M.K. Prasad, et al, 'op.cit', p.74
60. Kerala Forest Research Institute, 'op.cit'.
61. P.V. Devidas, Palghat Ennale Ennu, Nale, KSSP, Trivandrum 1981 and M.P. Parameswasran, Palghat Jilla Vikasana Rekha, KSSP, Trivandrum, 1981.
62. M.P. Parameswaran 'Virakum, Kalkariyum, Vaidyuthiyum' and C.P. Narayanan 'Silent alley Uyarthunna Preshnangal in *Chintha Janma Dina Pathippu*, Cochin, 1979, pp.105-116.
63. The suggestion of Prof. A. Abraham, the Head of the Science and Technology Committee, Kerala at the 1980 KSEB state managed seminar on Silent Valley quoted in Darryl D'Monte 'op.cit.', p.52
64. M.G.K. Menon, 'op.cit' p.12
65. M.S. Swaminathan, 'Report on the visit to the Silent Valley Area of Kerala.' Society for Protection of Silent Valley, Calicut, 1979, p.9
66. V.K. Damodaran, et al. (ed) 'Manushyanum Chuttupadum'. KSSP, Trivandrum, 1977
67. *Ibid*, p.5
68. *Ibid*
69. *Ibid*, p.18
70. Ibid p.18-19
71. M.P. Parameswaran, C.G.Santha Kumar, 'Naam Jeevikunna Lokam', KSSP, Trivandrum, 1985.

72. Journals like "ANKH' and 'SOOCHEE MUKHI' best represent such a crude environmentalist tendencies. For the responses of the Parishat see for example, K.N.Ganesh, 'Cheruthinte Thathwa Sastram', *Sastragathi*, Vo.21, No.2, May, 1987 and 'Parishtithiyude Rashtreeyam' 'Sastragathi' Vol.21, No.2, April, 1987. See also, K. Sachithanandan, 'Paristhit Rashtreeyathinte Prathyayasastram' 'Sastragathi' Vol.21, No.8 and 9, 1987 Zoological Survey of India, Madras 1981; and NC Nair, 'Further Investigations on the Botany of Silent Valley', Botanical Survey of India, 1981
73. See for example 'Science in Society' (Mal.) in 'Pravarthaka Pariseelana Rekha 1982, pp. 16-27
74. The discussions have not been summed in book yet but they largely form the basis of M.P. Parameswaran's book on theory of knowledge published M.P. Parameswaran, 'Marxian Jnana Sidhantam', Chintha Publishers, Trivandrum, 1986. See also a critique of Parishat's approach to science vis-a-vis PPST group Joseph M. Pamter, 'Peoples Science? An Interpretation of the 'Peoples Science Movement in contemporary India'. Cambridge, 1987.
75. The book has already gone through five editions. The fifth edition was brought out in 1981. K.N. Syamasundaran Nair, M.P. Parameswaran, 'Keralathinte Sampathu', KSSP, Trivandrum, 1981
76. See for example, 'the Economic Review 1987, GOK, Trivandrum, 1987; V. Viswanatha Menon, 'Budget Speech 1987-88, GOK, Trivandrum, 1987, T.N. Krishnan, Kerala Economy Performance Problems and Prospects, typescript, CDS, Trivandrum, 1988.
77. Gramavikasanam, KSSP, Trivandrum, 1984
78. Thomas Isaac, 'Keralam Mannum Manaushanum', KSSP, Trivandrum, 1987
79. 'Kerala's Eighth Five Year Plan – An Introduction to Discussion', forth coming, KSSP, Trivandrum.
80. See for example Henreb Renting, Jan de Jong 'Kerala Sastra Sahitya Parishat, From Science to Politics' Trivandrum, 1987, pp.11-15.
81. K.Venu, 'Keralathinte Prathisanthi' 'Mathrubhoomi Weekly Vol.65, No.4, and 6, 1987
82. K.P. Kannan, Syama Sundaran Nair (Ed.) 'Keralathinte Krishi, KSSP, Trivandrum 1978; 'Grama Vikasanam, KSSP, Trivandrum, 1984, and M.P. Parameswarn, 'Land-Water Resources' in '22nd Annual Conference Souvenir, KSSP, Trivandrum, 1985 and 'Introduction' to '24th Annual Conference Souvenir, KSSP, Trivandrum, 1987
83. '23rd Annual Conference Souvenir, KSSP, Trivandrum, 1986 and 'Vyavasaya valkaranam Chodyotharangal, KSSP, Trivandrum 1987
84. '24th Annual Conference Souvenir' KSSP, Trivandrum, 1987. See also Thomas Isaac, M.P. Parameswaran, 'Kariyunna Kalpa Vriksham', KSSP, Trivandrum, 1984
85. V.A Sreekumar (ed), Nadinu Cherna 'Sanketika Vidya', KSSP, Trivandrum, 1978
86. K.P Kannan, K.K. Krishna Kumar, 'Vyavasayavalkaranam Purogathiyude Margam, KSSP, Trivandrum, 1977, pp 19-20
87. M.P. Parameswaran, 'Vidyuchhaktiyum Keralathile Vyavaya Vikasanavum' paper presented at the Seminar organised in connection with 10th Annual Conference of KSEBWA, April 20, 1975.
88. 'Oorjam Chodyotharangal', KSSP, Trivandrum, 1988.
89. Kaleeswaran Raj, 'Thapanilayangalum Sastra Sahitya Parishathum' 'Madhyamam' and K.N. Ramachandran, 'Oorja Pratisandhiyum Vikasana Prasnangalum' 'Mathrubhoomi Weekly' November 1-7, 1987
90. M.P. Parameswaran, 'Thapanilayangalum Sastra Sahitya Parishathum' 'Sastragathi' January, 1988. See also M.P. parameswaran, 'Orja Prathisandhi marupati 'Mathrubhoomi Weekly' November 29-Decemberss 1988 and RVG Menon, 'Vaidyuthiyum Vikasanavum' Mathrubhoomi Weekly, December 13-19, 1988

91. M.P. Prameswaran, 'Indian Anavaparipadi' KSSP, Trivandrum, 1988

92. 'Parishat Aduppu Pravarthakarude Kaipusthakam', KSSP, Trivandrum, 1987.

93. 'Vanasamrakshanam', KSSP, Trivandrum, 1984, M.P.Parameswaran, 'Kudivellathinu Kadu Samarashikuka KSSP, Trivandrum, 1987, M.K. Prasad, 'Kadum Nadum', KSSP, Quilon 1982, M.K. Prasad, 'Nammude Kadukal' in 22 Annual Conference Souvenir' and 'Vana Samrakshanam Oru Jeevan Marana Prasnam' KSSP, Trivandrum, 1984.

94. 'Samoohya Vanavalkaranam Arkku Venti"? 'Sastragathi' Vol. 20, No.2, May 1986, p. 18-23

95. 'Grama Vikasanathinu Panchayat Level Committee Anaupacharika Aasoothrana Samathikal' KSSP, Trivandrum, 1981; 'Grama Padanam: Pradhamika Sameepanam', KSSP, Trivandrum, 1984 and 'Grama Vikasana Charcha' in 'Grama Sastram, No.40, May 1980

96. C.G. Santha Kumar, 'Kuttikalum Sastra Bodhavum' KSSP, Trichur 1986 and 'Balavedikal', KSSP, Trichur, 1981

97. 'All India Childrens Festival 1987' KSSP, Trichur, 1987.

98. 'Sastra Sahavasa Camp', KSSP, Trivandrum, 1`987

99. C.G. Santha Kumar, 'Vidyabhyasam AnchuVayasinu Munbu', KSSP, Trichur, 1984 and Unnikrishnan K. 'Nursery Vidyabhyasam Entu, Entinu, Engane?' KSSP, Trichur, 1986

100. Kerala Sastra Sahitya Parishat – A Peoples Science Movement', p.5

101. 'Vidyabhayasa Rekha', KSSP, Trivandrum, 1983

102. 'Ibid'

103. 'Vidyabhyasa Charcha', KSSP, Trivandrum, 1983, C.G. Santha Kumar 'Vidyabhyasa Rangathe Azhimathikalkethire Sangatikkuka' KSSP, Trivandrum, 1984; 'Vidyabhyasarangathe Asastriyathakale Cherukkuka, KSSP, Trivandrum, 1983; 'India Governmentinte Puthiya Vidyabhyasa Nayam, KSSP, Trichur, 1985 and C.G. Santhakumar 'Vidyalayavum Rakshithavum', KSSP, Trivandrum, 1983.

104. C.G. Santha Kumar, 'Saksharatha Pravarthanam', KSSP, Trivandrum, 1978.

105. See 'Irupatham Varshika Report' for an evaluation of the publication schemes.

106. R. Ramachandran, 'Manathu Nokkumpol', KSSP, Trichur, 1986 and Babu and Johnny, 'Dhoomakethukkalku Swagatham', KSSP, Trichur, 1986

107. 'Sastra Kala Jatha Souvenir', KSSP, 1980

108. K. Raj Mohan, 'Arogya Sena Unit Pathana Rekha', KSSP, Trivandrum, 1984, 'Arogya Rekha' KSSP, Trivandrum, 1983, and B. Ekbal 'Nammude Arogyam, KSSP, Trivandrum, 1983

109. B. Ekbal, 'Revolutionary in Form, Reactionary in Content' 'Socialist Health Review', Vol. 11, No.2, 1985. K.P. Aravindan, (ed) 'Janakeeya Arogyam' KSSP, Trivandrum, 1986.

110. B.Ekbal, 'Niroridhicha Marunnukal, Nirodhikenda Marunnukal, Avasya marunnukal', KSSP, Trivandrum, 1986.

111. 'Drug Information Packet', KSSP, Trichur, 1986

112. K.P. Kannan, 'A Peoples Survey on Peoples Health, 'Science for Social Revolution', Vol. 1 No.1, Jn-Feb, 1988 and 'Survey Pravarthakarkulla Kaipusthakam, KSSP, Trivandrum, 1987

113. K.K. Krishnakumar, 'Bhopal Duranthamalla Koottakkola', KSSP, Trivandrum, 1985 and also, 'Gandhiji Bhopalil', KSSP, Trivandrum 1986.

114. V.K. Damodaran, 'Yudhavum Sastravum', KSSP, 1984 and Thomas Isaac, 'Anava Yudhathinte Soothra Vakiyam, *Sastragathi*, July, 1986

115. T.P. Kunjikannan and Babu Ambatt, 'Yuthame Vita', KSSP, Trichur, 19

116. 'Parishathum Stree Prasnavum', KSSP, Trivandrum 1988.

Part II

Experience of Pan Indian PSM

M.P.Parameswaran

The document *"Science for Social Revolution. The experiences of Kerala Sastra Sahitya Parishath"* was initially prepared as the theme paper for the first All India People's Science Congress held at Kannur on February 11-12, 1988 as part of the Silver Jubilee Conference of the KSSP. The document was subjected to a thorough discussion, occasionally quite heated. There were persons who were not quite convinced of the need for a definition for PSM, to characterise it. There were a few who did not comprehend the meaning of "partisanship towards the poor, the exploited majority. They thought that science has to be neutral. There were, also, confusion about what is meant by partisanship toward the poor. To the KSSP, this partiality came naturally because of the environment within which it was born, from its experience of two decades and not the least because of the predilections of its activists. It was not so easy for others, even if they were partisan in their politics. They found it difficult to comprehend partisanship in science.

However all of them were signatories to a perspective document which enjoined them with a certain outlook on our society, the role of science in it and with a certain code of conduct, of being secular, democratic, non-communal and of not taking funds from foreign agencies.

These 26 organizations which formed the first AIPSN were quite heterogeneous in nature. There were organizations like KSSP with a well defined social outlook and world view. There was, also organizations like Kannada Rajya Vignan Parishat or Srujanika or Ekalavya, which were involved only in science populariation or in education. The organisational strength either in numbers or in experience or in both was quite uneven. It was on such a base that an All India Peoples Science Movement was to be built up.

The BJVJ of 1987 had, certainly, led to a pan-Indian group which had just carried out one important task: the BJVJ How do we go forward? What could be the immediate tasks/activities it

can/has to undertake? What organizational form it has to take? After substantial discussions the group came to the following decision:

i) A loose federating net work of all the 26 organizations which came together to carry out the BJVJ may be formed and it may be called the "All India People's Science Network."

ii) The Federation will have only organizational membership - one organization, small or large, will have one membership

iii) The first nationwide activity that can be taken up could be a massive campaign of classes - on the lines of the Nature, Science and Society classes of the KSSP.

(iv) The lecture material in the form of slides, posters and printed matter could be prepared in a central workshop at a suitable place.

The common feature for most of the organization is a commitment to rationalism, and a scientific world out look. And that is why the topic Nature, Science and Society was taken up the first campaign.

Dr.Vinod Gaur was, at that time, the Director of National Geophysical Research Institute at Hyderabad. He was an ardent supporter of People's Science and had allowed two of his scientists to participate in BJVJ for about two months, on duty. Naturally we approached him to allow the use of NGRI guest house to organize the material software production workshop. He joyfully agreed.

The NGRI workshop was one of the most productive ones ever held by the AIPSN. A set of 250 slides were made covering micro and macro universe, origin of life and evolution of human species and development of human societies. These were divided into five or six presentations of one hour to each and could be used to impart a full course. Multiplication of the slides was a great problem. The normal way would have cost more than one thousand rupees per set. But with the help of Gemini Color Lab, a hundred sets of slides, in reel form was made using the regular film print making equipment.

If we take the nation as a whole, several tens of thousands of classes would have been held. "Would have been held!" Exact numbers were never reported. This was to become a major weakness in science movements not keeping written records, not preserving whatever was made and not communicating - a certain lack of historicity.

A major movement building activity was already on the horizon. A National Literacy Mission had been set up. Sam Pitroda, at the instance of Shri. Anil Bodia, then Secretary of Education, Government of India, approached the KSSP, requesting help for organizing a major mass mobilization to place literacy on national agenda. This led to the project of a massive nationwide jatha, larger than BJVJ which had resulted in the formation of AIPSN. Many member organization of the AIPSN were reluctant to take such a huge responsibility as was envisaged for literacy – about 400 district jathas, each touching 150 panchayats, over a period of 41 days - October 2 1990 to November 14, 1990. None of the members, except KSSP, had any mass experience previously. They all considered it as impracticable. Also, many argued, that it will divert the AIPSN from its main activity, namely science popularization and critique of policies. Much of the opposition cam from city based organizations with little mass base in village. However, ultimately it was decided that the AIPSN should get involved in literacy too, because an illiterate India cannot become science literate.

The NLM was ready to provide the necessary funds, but who will receive it? Earlier, for BJVJ, the Delhi Science Forum received funds from NCSTC, on behalf of the National Organizing Committee. Now we have the AIPSN which was yet not a legal body. It was decided that a new body will have to be registered. The jatha will have to be given a name. Through a lot of consultations, the jatha was christened Bharat Gyan Vigyan Jatha and the new society which was to be formed was

christened as Bharat Gyan Vigyan Samithi. The term Gyan Vigyan was selected with a purpose: to denote both Wisdom (Gyan) and Science (Vigyan). It was with much hesitation, because of the sheer magnitude of the project, the decision to organise the Bharat Gyan Vigyan Jatha was taken, in 1989 February. The Jatha was to be undertaken from October 2 to November 14, 1990. There was enough time for preparations. In most of the states the PSM organizations were nascent. They have come into existence only through the BJVJ of 1987. None of them had district or sub district organization structures, even KRVP, TNSF, PBVM, MVP etc. which were earlier existing organizations didn't have any district structure.

The BGVJ has to be conducted at district and village levels - in 400 districts and in 60,000 nodal villages, each district jatha reaching out to about 150 villages. The project, provided for maintaining one full timer for two or three districts for a period of 18 months, to help the formation of organizational structures at both state and district levels. It had provision to appoint 150 Literacy Ambassadors - a new term coined for this purpose. The BGVS was lucky enough to get Malcom S. Adisheshiah as its founder president. He was a much respected educationist and economist not only in India but also all over the world. M.P.Parameswaran was the founder secretary and late Prof. E.K. Narayanan the founder treasurer. To begin with a small flat in K Block, Saket belonging to Dinesh Abrol was used both as residence and as office for BGVS. Later it was shifted to a three bedroom flat in C Block. That was a residential office f BGVS. The detailed project was prepared in April 1989 and was approved in June. Initially this project was conceived as a Train Jatha to make it something unique. There were to be four dedicated trains two running north south along different routes and two running east-west again along different routes - broad gauge and meter gauge. Each train will have an exhibition section of 10 bogies, a bogy for residence, another for pantry services and another for administrative purposes. In each station it will halt for two days - 45 locations for each train - in all 180 locations. In each location, the scientists, social activists, political leaders etc. travelling in the train will fan out to towns and villages 40-50 KM around the station and will interact with the public, the youth, the students imparting to them a great dream - the dream of a fully literate India calling out to them to join the second struggle for Independence - freedom from illiteracy.

There was, also, the alternative proposal, of organizing discrete district level jatha in 400 districts, each jatha to cover 150 villages. It was the second scheme that was finally decided upon and submitted. The experience of running the BGVS project for one and half years was unique. M.P. Parameswaran had, already, been nominated to the Executive Committee of the NLMA. Education Secretary, Late Shri. Anil Bordia, Director General of NLM, Shri. Laxmidhar Mishra, other officers like Shri. Anil Sinha, Ms. Anitha Kaul - all had very high confidence in and regard for BGVS and its leadership. In the EC meetings the secretary of BGVS was considered on par with the Director General of NLM – the BGVS was considered as a parallel, non formal, wing of the NLM.

Prof. Yash Pal was, at that time, Chairman of the University Grants Commission. Yash Pal was an old time friend of the PSM. When M.P. Parameswaran organized a meeting of scientists in TIFR and BARC, in 1966, to initiate a Pan Indian Movement for popular science literature in Indian languages, it was Prof. Yash Pal who joined it as a representative for Punjabi language. It was, he, again, as secretary to Department of Science and Technology, Government of India, who supported the KSSP to organize its Bharat Yaatra of Sastrakala in 1985, in memory of the thousands who died in the Bhopal gas tragedy. Now as Chairman, UGC, he instituted 150 Fellowships, on par with FIP Fellowships, especially to work for literacy, as Ambassadors. The selection would be made by the BGVS and recommended by Director General, NLM. This scheme was operational for about 3-4 years. But during thus entire period the BGVS could get, in all, only about 40-50 teachers as UGC,

fellows. There were quite many 'progressive' teachers, in the country. They could have taken two years off to work for literacy - their pay and all service conditions are protected by the UGC. But most of them found work as Literacy Fellow, too exacting, too demanding. The existing situation of "arm chair progressiveness" was much more comfortable. As a result, most of the people who joined the literacy movement were non academic. This greatly reduced the potential of PSM as we were to see in later years.

Even while the discussion on the BGVJ was going on, the KSSP submitted a proposal to the NLM to make Ernakulam District fully literate and the project was approved. This was, later, to give birth to the "Ernakulam Model" and a nation wide campaign.

ERNAKULAM TOTAL LITERACY CAMPAIGN

The Ernakulam TLC was a watershed or more correctly a booster rocket for PSM. It was a union of head, hand and heart. Nearly thirty thousand volunteers participated in it, without expecting anything in return except the sheer joy of doing literacy. It had several features which were absent from all previous experiments. Here is an experiment where the government and an NGO - the KSSP is Not a Government Organization - worked hand in hand. It had a headquarters or control room - which was never locked from outside till the campaign was over, where government officials and KSSP activists worked together. The government officials got transformed into social activists. Later many IAS officers have become real social activists - like Nagarjuna from Andhra Pradesh, Harsh Mander from Madhya Pradesh, Raghunathan from Karnataka, Venugopal from PMO's Office, S.R.Sankaran etc. There were, also many others who remained in service but continued to be compatriots of PSM - like Anil Bordia, Lakshmidhar Mishra, Anitha Kaul, Arabind Behra, Madan Gopal... to name only a few.

In Ernakulam, the TLC helped to reduce the distance between the people and the bureaucracy. One specific activity of the literacy programme was taking the learners to visit police stations, collectorates, courts, post offices, village offices etc. The people became less afraid of the bureaucracy and they in turn became less suspicious of the people. The entire campaign was directed and kept alive by a group of committed KSSP activists and government officials. The KSSP activists too were, mostly, in government service from where, they have beeen transferred to the TLC office "on special duty'. In the TLC office the working day (and night) was 16-18 hours long. Many slept in the office or in the field. They became almost strangers in their own homes, but they got many more homes and large number of "near and dear ones".

It was possible to take Ernakulam as an experimental district because the District Collector Late Shri. K.R. Rajan was an activist of KSSP and was its Vice President years ago and the actual initiative came from him. What the KSSP did was join him. However the NLM could not fund a Collector and the collector alone without the help of grass root organisations cannot be effective. The NLM was ready to fund such an experiment if the KSSP was ready to take up the responsibility. They had full confidence in KSSP. That was how the KSSP took up the project. Even then, the programme was run not directly by the KSSP, but through a separate District Literacy Society specially registered for this with the District Collector as chairperson. This organisational mode was later to be extended all over India as ZSS, the *Zilla Saksharatha Samithi*. When during next year, in 1990 the Total Kerala Campaign was launched, a State Literacy Mission Authority was registered to run it. This time the funding was directly to the SLMA.

Many features of the future nationwide campaign emerged from he Ernakulam experience-like

(i) Government - civil society partnership

(ii) A round the clock control room under the guidance of a non-governmental secretary

(iii) Completely voluntary instructors, master trainees etc.

(iv) A small team of "double full time" crusaders

(v) Massive preparation of ground

The Kalajatha was a tool developed by the KSSP both for environment creation and for organization building. Later hundreds of districts in India were to forge this tool and use it successfully. The principles, saturation propaganda, repeated propaganda and continuous appreciation were all successfully used in Ernakulam and elsewhere.

The PSM units in other states, especially the Hindi speaking states were not at all confident that such Kala Jathas can be organized in the north. The Ernakulam district was able to provide about 500 activists to be sent to Bihar and Madhya Pradesh, to demonstrate the feasibility of locally organised Kalajathas. Together with an equal number activist - artists from these states, KSSP could organize about 40-45 district jathas for about two weeks duration. The confidence gained from this too was to play a great role in building up TLC movements in these districts. The training system, the district specific "text books" etc. too were the contribution of the Ernakulam TLC.

The membership of KSSP doubled, from about 30000 to about 60,000 during the *literacy years*.

Most of the activists of PSM in north and even in Andhra, Karnataka, Orissa, Maharashtra came from the ranks of literacy activists.

KSSP was initiated by an educated middle class. It's slogan "Science for Social Revolution" emphasized on scientific knowledge. It was not an economic, class based organization. It had nothing to "get from the government". It was to "give to the society". Its members, mostly employed and earning a tolerably decent livelihood felt it their duty to give back to the society something more than what their paid job demands. They gave their time - to read, to teach, to organize, to sell books etc. The only reward they get from work in the KSSP was the joys of doing work. KSSP survives on publishing and selling books. It publishes annually books work more than Rs. 10 million and its members - professors, engineers, teachers, doctors, mechanics, lawyers etc. go house to house to sell books. It is this time they spent that gets transformed into 'profit' of book business which helps run the movement.

The strength of the PSM is in ideas, in knowledge and not in numbers. It cannot equal to trade union or youth organizations in number. But it can give to these organizations knowledge, especially scientific knowledge which can become a weapon in their hands. A PSM cannot be of any use to the "P" without a strong "S" content. Those who can provide "S" - Science - are generally well placed in life and don't require any compensation or remuneration for providing "S". This is a very important point. The experience of KSSP proves this. People value KSSP not for it ability for mass mobilization, but for the scientific and intellectual contribution it has made in areas like environment - forest, land use, pollution, Silent Valley and so on - in education, health care, water management, energy, people's planning etc. etc. The activists of PSM have to upgrade their knowledge continuously. The PSM should attract increasingly large number of scholars to work for it.

The PSM plays two important roles: one to expose and oppose and the second to counterpose and propose. There are several policies of the government, both old and new, which are propounded in the name of science and development, but which affect negatively the poor and exploited majority. The PSM strives to expose the anti-poor character of these policies and oppose them in two ways: first by educating the public and raising their consciousness against such policies and provoking them to action - generally similar to actions carried out by mass movements and political parties. The second form of struggle is by counterpoising and proposing alternative policies and implementing the same of them whenever possible. What KSSP has done in education, in energy, in waste

management etc. as opposed to the general policies of the government and they are demonstrated through field implementation. The peoples education or citizen education has three levels: (i) informative, imparting information (ii) ideative generating ideas and vision and (iii) provocative persuading people to action, appealing to *dimag, dil* and *dum.*

From Ernakulam to whole of India

Inspired by the Ernakulam experience and the role played by the then District Collector Shri. K.R. Rajan, similar proposals were being formulated by Shri. Madan Gopal for Dakshin Karnataka by Ms. Ratnaprabha for Bijapur, by Mathews for Pondichery, by M.N. Roy for Midnapur and by.... for Durg districts. Only Pondichery had grass root level support of the Pondichery Science Forum. Rest of the districts was led by district collectors. PBVM and KRVP were never involved in Literacy. In West Bengal literacy work was looked after by Bangeeya Saksharatha Prachar Samithi under the leadership of the Chief Minister, Jyothi Basu. In Karnataka only after the Karnataka State Unit of BGVS became effective, new Total Literacy Campaigns could be initiated.

The BGVJ was fully successful in its projected objective: to create an environment conducive to literacy and to create a demand for it. Even before the Jatha proper began several districts began preparations for total literacy campaigns. In the majority of these cases, a proactive District Collector ably supported by a BGVS/PSM district and state level group took the initiative. The success of the Ernakulam project and the launching of Total Literacy Project by the Kerala government, too contributed to this very much.

The BGVS did engender a demand for literacy. Not only that. It engendered a huge demand for primary education. Mothers attending literacy classes wanted their children to go to school. Many schools in the North could not meet the requirements. This made the environment ripe for the movement: Education for all resulting in the Sarva Shiksha Abhyan. The BGVS, which was registered in August 1989, was, at that time, conceived as a short lived organization with only one task to carry out – to conduct the Jatha. The BGVS would be dissolved in 1991. There was the AIPSN to carry forward the rest of PSM work. The Constitution of the BGVS still reflects this aspect of limited duration. However, even before the Jatha was on, BGVS became thickly involved in the actual literacy campaigns in several states. It became an integral national leadership team together with the NLM. It was not possible to even think of winding it up in 1991. The NLM wanted BGVS and was willing to give all support to maintain a national centre with necessary personnel, at Delhi. BGVS was, for all practical purposes, the formal- informal arm of the NLM and MHRD. Units of BGVS came into existence in almost all the states. In some states like Kerala, Tamil Nadu, Pondichery and West Bengal the existing PSM units functioned as BGVS units. However in Kerala, separate state BGVS units and the district BGVS units were registered for some specific purpose. Every other state separate BGVS units sprang up. This led to some conflicts with prior existing PSM units, in Bihar, Haryana and Himachal.

At national level this was to lead to a long drawn and meaningless confusion about the roles of BGVS and AIPSN. Many of the older AIPSN units either became inactive in AIPSN like KRVP, MVP, HVM, Assam Science Society etc. or became defunct such as Arogya Dakshata Mandal, Lok Vidnyan Sanghatan, Doon Science Forum, Srujanika etc. Same was the case with Trade Union cum PSM organizations like FMRAI and CASU. The BGVS units in north were mainly involved in literacy and have a national coordination centre which is functional round the year on a campaign mode. The AIPSN, on the other hand, is highly federal in character. Its constituent members seldom felt the necessity of national help. Neither was the national centre able to give any organizational guidance or leadership except for occasional isolated campaigns. The pace at which these two national centers could move were very much different and there were bound to be dissonances. For a long

time this identity conflict between BGVS and AIPSN played a negative role in the progress of PSM in India. Still, it progressed, thanks to the demands of the literacy movement, which was transcending literacy to education, information, watershed development, women development, employment, health etc.

During the two decades between 1992 and 2012 several national programmes were organized, besides the All India People's Science Congresses held every two years. After the first AIPSC at Kannur, 12 more had been held, at Kolkatta, Bangalore, Mumbai, Hissar, Hyderabad, Bhopal, Nalanda, Chennai, Shimla, Gauhathi, Ranchi, Trissur and the 64th is scheduled at Lucknow. After the first BGVJ, several more jatha were conducted on a national scale, thanks to the funding from NLM, except the peace and secularism jatha held in 2003. We had the second BJVJ Bharat Jan Gyan Vigyan Jatha, the Samatha Jatha, The Hamara Desh Jatha, The Saakshar Bharat Jatha and the Right for Education Jatha - all funded by NLM or MHRD, through BGVS. In all these, except the last two AIPSN too was a functioning partner.

Through these multifarious programmes the PSM had grown into a really national movement. It has state level organizations in all most all states except Mizoram, Goa, Jammu and Andaman. In these states too we have contact groups. We have district level organizations in about 350 districts, groups in over 20000 panchayaths and contacts in another 30000 or more panchayats. The combined membership of all these organisations will come to nearly half a million. There was a time, during the peak of literacy campaign, when we could have contacted nearly 7-8 million volunteers and steered them into democratic movements. But that required much larger leadership input which BGVS could not provide. Even today a committed and capable leadership can attract at least five million volunteers for sustained activities. But the PSM has no leadership strength to cash this opportunity.

Besides the aforesaid Jatha, the Cosmic Voyage, Joy of Learning, Health for All, Climate Change, Peace and Secularism etc. were other areas in which nationwide programmes were undertaken. The Samatha Jatha gave birth to the Samatha movement, conceived as a broad platform for all women's movements. Again due to lack of dynamic and capable leadership on the one hand and slavery to bannerism on the other hand, what would have been possible could not be realised. Self Help Groups were an outcome of Samatha. But only the MALAR group in Kanyakumari district got graduated. The PROCHEST of a group in Assam and the HUNAR group in Jaipur are other two groups which are surviving. However by far the most successful enterprise development was that of Delhi Science Forum and Centre for Technology Development in leather processing and fruit products. The FARMER brand of food products from Mandi, Himachal Pradesh has become an established one.

"Science for Social Revolution" is an important solgan of People's Science Movements. However it is understood differently by different organizations and persons within organisations. What role science can play consciously? This is not understood in the same manner by everybody. The question of the role of political parties and relationship between the two and their roles are still bones of contention. However, science for self reliance for peace and for unity was a unifying slogan. Late eighties and early nineties was a period of completing the reversal of Nehruvian path of development - on socialistic pattern - and of full fledged embrace of the neoliberal path. The PSMs were all united against this. Every unit of PSM was convinced of the necessity to fight this. They were active in preparing materials for public education against this sell out. In 1990 June, a one day brain storming of economists, constitution experts, technologists, scientists etc. was held in Delhi, to explore the possibility of placing before the people a different path of development embracing not only economics but also politics and culture. However, most of them were so worked up about the

impending signing of the GATT agreement. They had only single point agenda: to stop the Government of India from signing the GATT experiment. It was obvious that this would not be successful. People will have to be mobilised in a large way. They will have questions to ask. Satisfactory answers are to be given. They do not exist, but have to be thought of. The entire concept of development will have to be reworked. The importance of equity, of continuous reduction in inequalities, as well as, the importance of sustainability has to be understood. There were people capable of working out a totally new view and credible perspective, a Manifesto for the Future to be placed before the people. It would have required the full time work of a good number of people for a few years. It was organizationally possible. The possibility of taking them on UGC Fellowship was alive. But they preferred adhoc actions which never added up to anything great. Being not satisfied within, the author of this part, M.P.Parameswaran, "a jack of many trades and master of none" decided to bell the Cat: He prepared an essay "A New World: A New India" which was published by the BGVS. This was in 1994. Before that he had placed before the PSM the possibility of organizing a nationwide Jatha centered around local economy and local development. The document is called "In Defence of India".

It was an ambitious project consisting of :

1. Lok Sampark Andolan
2. Balmelas
3. Mass Singing for National Unity
4. Unity Train
5. Giant Banner

1. The Lok Sampark Andolan got materialized in the Hamara Desh Jatha which culminated at Hyderabad. The main slogans of this exercise were: "Desh Ko Jane, Desh Ko Badlein" (let us know the country and change the country) and "Sub Rang Ka Samavesh Bharat Desh Hamara Desh" (My country Bharat is a garland of all colours) The first was politico-economical and the second was cultural. The major activities prior to the Jatha - the jatha itself was novel in character organized as relay cycle Jatha - were:

i) Peoples Assemblies, from village-gram panchayat level to district level culminating in a National Parliament at Hyderabad

ii) A large number of dialogues/discussions at various levels on topics like Our Society, Power to the People, etc.

Hamara Desh - Resource Papers and Dialogue materials.

1. Heritage of Technologies	-	Probir Purkayastha
2. Our Lives: Core Sector Industries	-	K.Vijayachandra
3. Our Independence		
4. Habitat	-	Chandan Mukherji
5. Health for All		
6. Self Reliance in Energy	-	Ashok Rao
7. Power to the People	-	M.P. Parameswaran
8. Our Society	-	M.P. Parameswaran
9. Crippled with Consumerism	-	M.P.Parameswaran
10. Economic Reforms	-	Arun Ghosh

2. The entire focus of the programme was to empower the village, the gram panchayat. The philosophy was that a strong India can be built only on the basis of strong villages. The initial phase of the Hamara Desh Jatha was quite successful. But Lok Sampark or People's Dialogues could not be maintained. The huge mobilization ultimately did not bear any fruit. Again the weakness of the complementary moments, of social and political movements resulted in the failure of raising a crop after the thorough preparation of the ground.

The mass singing consisting of lakhs and lakhs of individuals/groups singing songs of peace, unity, compassion and justice for a period of one week or so was planned as an environment booster. This was tried, earlier, in Kerala to help create an environment surcharged with the idea of total literacy. However this did not take place in the sense it was envisaged.

3. The Balamelas, including teacher exchange programmes were envisaged as preparing ground for the citizens of tomorrow. It had two elements in it : (i) Children are the best torch bearers of peace, love and harmony (ii) Through their involvement only we can transform teachers into mentors of tomorrow.

4. The unity train was the resurrection of an idea originally floated for BGVJ, but was discarded later. It was, however, discarded now too because of the huge effort required.

5. The Big Banner was a transformation of the concept of human chain, involving tens of thousands of farmers, spinners, weavers, volunteers and artists. Two meter high unbroken banners extending from Kanyakumari to Srinagar and from Porbunder to Teen Sukdia - about 8000 kilometer in total length. Two million poles will be specially raised for this, hundreds of hectars cotton will be planted for this, it will spin and woven by volunteer textile workers, and it will be erected by volunteers and painted by people. The idea was to involve a million people for about two years to exhibit the strength of unity of purpose. This is an idea worth reconsideration. During the Right to Education Jatha of 2011-2012, in about 800 villages banners several meter long were made and all brought to Delhi as show of strength and unity.

These dialogues were planned in an extensive manner to be taken through, at least, two months. An elaborate scheme to train facilitators for conducting them was envisaged. The detailed write up of this training programme is given Appendix I. This was prepared in 1996. Because of a variety of reasons such an elaborate training programme could not be conducted. The 14th AIPSC is also the Silver Jubilee Year of AIPSN. It will discuss a PSM Vision of Future India. In the Congress, this discussion will be only initiated. It has to be taken forward. A note - chapteration of a book on *PSM Vision*, is given as Appendix II. They should become topics for at least a year long discussion within each unit of AIPSN. There could be several versions of each topic. This discussion will be initiated in the 14th AIPSC.

The dialogue material on "Our Society", prepared for *Desh Ko Jane, Desh Ko Badlein* gives a clear picture of the spirit of the campaign. It envisages dialogues with rural poor, urban middle class and the intelligention. The main focus in every case was to be the following points.

1. We are hungry, naked and homeless.
2. Our children are ill-fed, ill-clothed, uneducated.
3. We want a better deal for them and for us.
4. There used to be a time when in some countries at least everybody was well fed, well clothed, employed and educated. Things have become bad in those countries now. But we know that it is possible to have better life.
5. There are many schemes in the name of the poor - but the rich benefit by them.

6. We ask for a better deal - we are beaten up.
7. They make us fight each other in the name of caste, religion, language etc. so that they are safe.
8. They have purposely kept us illiterate.
9. There is nobody to whom we can complain - the officials, the judiciary, the government - all are theirs.
10. Some of us became desperate. But it does not help. Conspiracies cannot work.
11. Nobody else is going to save us. We have to save ourselves.
12. We do all the work, they enjoy all the fruits.
13. Without us they are dead, without them we are better off.
14. We have to fight this situation. If not today, tomorrow we will win.
15. Knowledge, determination and organization are our weapons. Literacy is the first step.
16. The women of Nellore has showed us one way.
17. There is no necessity for skepticism. The have-nots have to unite.
18. Soon we will have panchayat elections. Elect only honest people. Those who offer money are your enemies.
19. The panchayat/village is going to be your first fighting ground. There is infinite scope.
20. Certainly we can change our lives for the better.

CAUTION: The difference between "us" and "they" between the poor and the rich is depicted very sharply here. While transcreating into local forms care may be taken to see that too rough rubbings are avoided so that the "contact programme" can go on smoothly.

The PSM is truly a national movement. By middle of nineties the old stalwarts of literacy in the government all got retired. The new comers were not very much inspired by it. They were not willing to support the BGVS too. However the Rural Development Ministry had a number officers who knew BGVS well and wanted its help in converting the National Drinking Water Mission and the Watershed Development Programme into truly peoples programmes. The BGVS took up watershed program in a large way.

When Kerala launched the Peoples Plan Campaign, it caught the imagination of most of the AIPSN units. The Hamara Desh objectives again came to the forefront. A National workshop on decentralized planning was held at IRTC which provided the local hospitality. Nearly 100 persons from all over India went to IRTC for the training.

Participation in World Health Parliament at Dacca in 2001 gave a new impetus to the work of AIPSN in the field of health. In the Jan Swasthya Abhiyan (Peoples Health Campaign) which has over a dozen organizations. PSM units are leading members.

It was in the preparation of dialogue materials for the Hamara Desh Campaign that PSM sat down to write coherently its view about future India: economic, political and cultural.

Long Term Perspective

If PSM should have an impact on the course of history, it should have a long term perspective- as to where it wants to go. As mentioned earlier, both organizations which are part of AIPSN and members within these organizations stood at different levels, conversed in different languages, used different categories - it was not easy to arrive at a coherent perspective. Perhaps the first attempt was the booklet *A New World - A New India* by M.P. Parameswaran. It was criticized heavily. Attempts were made to take the discussion forward at the 8th AIPSC at Nalanda. Nothing happened. The next

serious attempt to define the perspective of PSM was done the 13th AIPSC. There were six papers in all - by Amit Sen Gupta, Dinesh Abrol, K.N. Ganesh, M.P. Parameswaran, Vinod Raina, and D.Raghunandan. These papers are reproduced as Part III of this book.

As could be expected there was much in common agreement, but there were points of disagreements too. What is attempted below is a critical assessment of the agreements, disagreements and differences. It is not an easy task.

Issues Which Require Deeper Discussion

1. *The very concept of "development"* is torn between two differing understandings: Both agree that it is not mere growth, that it should be equitable and sustainable - ensuring intra generational and inter generational equity. The difference sterns from answers given to the following questions:

(i) *Are there Limits to Growt?:* There is a stern view that there are. Another view is ambivalent, though in principle it too agrees about some limits.

(ii) If some or other form of limit is inevitable, where do we put that limit? At the needs level as against greed? Many argue that need and greed are not scientific categories and should not be brought into discussions. In which case, where do we put the limit to growth towards which we move asymptotically?

2. *Three Value Concept.* Goods and services that are produced have exchange value because they have use value. Large scale production of alcohol, narcotics, weapons etc. increases GDP. Each has its use value. But, do they enhance the quality of life of the society. There are goods and services which enhance the quality of life which have positive welfare values. There are goods which reduce the quality of life or have negative welfare values and there are yet other goods which have only vanity values, or zero welfare values. This categorization is important, especially under conditions of "limits to growth" PSM today has not a shared understanding of "quality of life"- How to quantify it? We have not spent enough time on it.

3. The concept of development or progress or *improvement in quality of life* has a certain non-material or spiritual element within it. To put it succinctly, this means increasing freedom from animal limitations of mere staying alive, and being able to ramble into the realm of truly human avocations - culture - to read, to trek , to sing, to hear songs, to play - anything one wishes to do, what Marx says, emancipation from all forms of alienation. This demands increasing liesure.

4. Increasing liesure means, consciously using growth of productive forces to decrease the socially necessary labour time required for the attainment of a high physical quality of life so that more and more liesure time is available for enhancing the spiritual quality of life. There are several related issues

5. The historical tendency of capitalism has been urbanization and metropolitanization. How this has caused rupture in nature's metabolism, how important it is to disperse industries within agriculture, how important it is to even out the population and abolish the contradiction between town and country - all this have been amply described in the *Communist Manifesto* and *Das Kapital.* The PSM has to take a stand in this: abolition of distinction between the countryside and the town. This does not, it should be understood, imply rejection of urban facilities which enhance the physical quality of life of humans in general. But it implies a certain habitat pattern and sure return of the nutrients taken away from the soil through food and other crops, back to the soil so that soil metabolism is maintained intact. It also means reduction in travel of human and transport of goods necessitated by organization of production for sustaining the life of the society.

6. This gives rise to a number of related issues such as relative size of production units (small? large? very large?), production organization (hierarchical or horizontally linked), technologies, energy requirements, sources of energy, waste generation and managements etc.
7. It is fashionable to praise the Gandhian ideal of self sufficient, self reliant village republics, going back to good old days. It is equally fashionable to reject Gandhiji's concepts as autarchic, impractical and retrogressive. Gandhiji never conceived his self-efficient village republic as an absolute entity, as autarchic. He was only redefining the linkages of the smaller society with the larger one – horizontally linked on an equal footing instead of the existing subservient hierarchical linkage. Technological hierarchy need not necessarily mean ownership hierarchy:
8. "Small is Beautiful" need not be taken verbatim. Large is less viable in the hands of the people. Small could be. However, it can survive only if it is powerful, or effective. Ought not PSM strive to develop technologies for production of goods to satisfy their needs, technologies which are viable in their hands and yet efficient and effective?
9. Here is an important question from which we cannot turn back: how much electricity we want. Often we start replying: that depends. We have to have an idea of what for we want energy and how much - whether our demand increases exponentially or asymptotically. As students of science we know that exponential increase of anything is unsustainable, that it has to turn asymptotic at some point. Which is that point?
10. Currently there is a major issue with regard to energy the question of nuclear energy in general and Koodamkulam in particular. What is our evaluation of potential accidents and the safety measure required to manage such accidents? Do we take a stand that Koodamkulam have all the safety measures required and should be allowed to function without hindrance or do we want more safety measures, including, may be, converting it into a thermal station? Do we feel that nuclear energy will be a major contributor in the coming 2-3 decades and that we cannot afford to reject it? Do we hope that some day or other in the near feature ways will be found to dispose radioactive fuel wastes permanently? Do we believe that the safety requirement in case of accidents of Kalppakkam Fast Breeder Reactors is adequate? Do we "believe" that our other five stations are absolutely safe and will never, never witness an accident of the dimension of Chernobyl? What is our assessment of second and third stages of Indian Nuclear Programme based on the experience of Fast Breeder Reactors world over? What will be the impact on energy availability in case we decide that no more new nuclear power stations anywhere in India will be built till the hanging issues of waste management, reactor decommissioning and management of worst case scenarios (Maximum Credible Accidents) are solved fully? We, PSM, cannot avoid answering these questions.
11. There is another knotty question bedeviling PSM. We are all brought up in an environment of hierarchy. It is in our subconscious. We are also, some how or other, convinced that democracy is the best form of governance. We intuitively feel that what we have in India is not real democracy, but what we call bourgeoisie democracy which is no democracy at all. We also know that there is something contradictory in the terms democracy and centralism, as centralism is opposed to democracy. Still we are at peace with the term "Democratic Centralism" How can we make the two mutually compatible? We know that the attempts of erstwhile USSR did not succeed in this respect. This question is important for the PSM, because we appreciate and respect the decentralization efforts and people's plans campaign of Kerala. We want that process to continue and to get deepened.

12. This is important in our struggle to build a different India, a different society. Many of us would be comfortable to call this new society by the name "Socialism". Of course, we hasten to add that this socialism is different from the 20th century socialism of erstwhile USSR. But how different? We have not clearly stated, because we are not sure. Nobody is sure.
13. Under such conditions do we think that such a new society can be built from top to bottom or from bottom up? If from bottom up what is the role that the PSDM has to play in it? What are the features of a new society, at the bottom? Its economic life? its politics, its culture, its relationship with similar other societies? As well as with the larger society as it exists today? Or in other words the strategy and tactics for building "from bottom up".
14. We are familiar with slogans and demands such as new and meaningful Land Reforms; Power to the People, More Powers to the States etc. How to realize them? The actions taken so far have not given any result. New actions are necessary, not a repetition of the old. Can local economic development and boycott of corporate products be thought of, as a new tactics?
15. We know that in a neoliberal dispensation of economy, the rich will become richer, the poor will become poorer, absolutely or relatively. We want to fight this. Which are the people who are becoming relatively richer? Can we allow them to grow richer and still reduce inequalities? If not how do we prevent the rich becoming richer and instead transfer part of their riches to the poor? Also to undertake, consciously, developmental activities which will preferentially accrue more benefit to the poor instead of the rich - for example agriculture instead of software industry!
16. What do we consider as a reasonable income, at present price levels, so as to ensure a high physical quality of life for a family of, say four? Definitely this cannot include cost of health care in five star hospitals or education in self financing institutions. Do we consider personal automobiles as a necessity? As a basic need? Any income above a certain minimum level gets spent for conspicuous consumption, on goods with vanity value only. If the present GDP of the country is divided more equitably amongst the population with inequality ratio less than three, there will be much less wasteful consumption and much less carbon emission. Carbon foot print is a measure of inequality too.
17. We often hear the expression Non Party Political Formation. This is a contradiction in terms. What is a political *formation*? It has to be a party. By non-party they mean only, perhaps, different from all existing parties. In that case our attitude will have to be different. It is not apolitical. PSM too is not apolitical. It is partisan towards the poorer half the exploited majority. The question we have to ask those in NPPF is this: on whose side they are? We are ready to work with everybody who are partisan to the exploited? Or are we not? Do we subscribe to a Single Party Concept?"
18. The Neighbourhood Groups formed during the initial period of PPC in Kerala were very effective in ensuring people's participation. Chavez is using the same organizational form in Venezuela - the *Bolivarian Circles* of 25-30 households each in villages. The formation of NHG, as the most intimate association of neighbouring families can play an important role in development, in building from bottom up the new society.
19. One of the major arenas of struggle for the PSM has been Intellectual Property Rights. We argue, and rightly so, that knowledge is not and cannot be a *property*. A property is something which gets reduced when shared. Knowledge does not get diminished, when shared. We have been opposing IPR for the past two decades, without absolutely any impact. Have we been using wrong tactics or wrong weapon? The realm of knowledge under IPR is limited and does not belong to production of essential goods necessary for life except in certain drugs. The universe of non IPR knowledge is far bigger: what we should do is to make all this knowledge – both

theory and practice - available to all the people across the world. In fact this is one of the very objectives of PSMs - to share knowledge, including technology.

20. The PSM should consider it as its prime responsibility - to search, find and transfer. Knowledge across the globe and make it available to our villages so that based on such knowledge and skills they can build local societies which are strong and which can coalesce with similar societies later to form a large system of horizontally integrated local economies - is such a dream realistic and durable? Or apolitical?

21. Are we going too slowly, while the events are overtaking us to at post speed? What we have achieved during the past 25 years? Are they commensurate with our potential? If not what are the reasons for our under performance? For example what are our achievements during the past three years? A set of training camps on climate change, a few experience sharing workshops and a few meetings under TSA. What we have done on the field, to combat global warming and climate change? With our strength we would have, for example, installed a million high efficiency cooking stoves and reduced the CO_2 emission by 2 million tonnes. We could have initiated a large number of local enterprises for fruit and vegetable processing. We could have intervened in agriculture, helping landless laboures to obtain land on lease and cultivate in a large way. We could have collected apt technologies from world over and made them available to local entrepreneurs. None of them has IPR attached to it. Instead we got bogged down to critiques. We could have prepared people's plan for reviving public sector drugs industries and to amalgamate the smaller, sick players into it and prepare a massive base for low cost drugs. We are lacking in something. We seem to be satisfied with general critiques, which give us some self righteous satisfaction. We are not prepared to engage with the enemy directly.

Or, is this criticism, though a self criticism, is too uncharitable? Are we expected to do only what we have done? Is engaging with the enemy the prerogative of political parties?

Part III

13th All India People's Science Congress
Papers on PSM

Learning from the Past and Looking to the Future

Amit Sen Gupta

(The General Council of the AIPSN took a decision to devote one full day to discussions about the conceptual and organisational perspective of the AIPSN, at the XIIIth AIPSC in Thrissur. The GC also invited contributions to this debate from organisations and individuals, so as to attempt to formulate a position paper. This position paper is a result of this decision. It draws from contributions received from several people and from some earlier articulations. This is to acknowledge that the paper draws from ideas expressed in contributions by K.N.Ganesh (KSSP), Sridip Bhattacharya (PBVM), Dinesh Abrol (DSF), D.Raghunandan (CTD and DSF) and Prabir Purkayastha. However I take full responsibility of the conclusions and suggestions in the paper. Others who have views that are at variance, would, of course, express the same during the discussions in Thrissur.)

1. The Heritage of Peoples Science Movement

The broad vision of the All India Peoples Science Network (AIPSN) and the Peoples Science Movement in the country is based on an understanding of how science and society are linked together. The idea that there is a need to develop an understanding of how the two interact is not recent. While science gained prominence as the driver of development under Capitalism, its interface with society received increasing attention. By the late 19th century, this led to several attempts to "communicate" science to large numbers. Initially such initiatives were often limited to attempts at simplifying scientific concepts, so as to make them better understood by common people. This evolved into a discipline that came to be called the "public understanding of science". The attempt then was to communicate, not just scientific concepts or theories but its value, utility, methods and way of working. These attempts, it was then argued, would make it easier for science to play a greater role in people's lives and thereby promote development.

The creation of the first Socialist state in 1917 stimulated people to look at human society in different ways, and this included the role that science plays in society. This new insight was perhaps

best articulated by the British scientist, J.D.Bernal. In his path breaking work, "The Social Function of Science" (published in 1939), Bernal developed a framework of understanding science and its effects on peoples' lives in the context of class divided societies. Before Bernal, the mode of interaction between science and the people was based on a simplistic model. In such a model, scientists were supposed to develop "genuine" knowledge; while science popularizers communicated simplified versions of this knowledge to the people. Bernal (along with other colleagues such as J.B.S.Haldane), shifted the focus away from merely communicating science to the lay public, to a process where people can participate in deciding how science should be utilised to liberate them from the generally poor conditions in which a majority of them were forced to live. We can understand this shift from what he wrote about science in India, then still under British rule. He asserted that the main social forces behind the development of science in India were not the scientists themselves but the political agitators behind the struggle for independence from colonial rule.

The People Science Movement in India grew out of this conception of how science and the mass of people need to engage with each other. The PSM traces its heritage to the national movement for independence, when the likes of Meghnad Saha and P.C.Ray saw the potential of science not in the way the British colonisers saw it, but a way to emancipate people from drudgery and oppression. The PSM draws it heritage from the science clubs that developed in many parts of pre-independent India (especially in Bengal) that combined the liberating potential of science with the awareness that science can thrive only among people who are truly free.

1.1. PSM: A Unique Movement

The Peoples Science Movement in India, is in many ways a unique phenomenon with very few parallels in the rest of the world. While people like Bernal introduced the notion that science can be part of a movement in which people participate, it did not take the shape of a movement in Europe or elsewhere. In many parts of the world science and society interaction remained confined to "science popularization", or its later incarnation as "public understanding of science". In places where progressive groups were involved, the movement still remained largely limited to movements of "scientific workers", i.e. involving people who worked in scientific institutions. Rarely were the common people seen as integral part of such movements, except as recipients of knowledge in a simplified form. The PSM in India is very different. Leaders of the movement need not fit the conventional definition of a "scientist". A village teacher, a working mother, women, youth and students - all of them form the PSM along with scientists and scientific workers. At the Peoples Science Congress in Ranchi in 2008, fraternal delegates from France and Brazil were wonderstruck that a science movement could be owned and organised by such people, that a science movement could be a movement that parallels other mass movements. The PSM today is, thus, also a model for building similar movements in other parts of the world.

One of the defining moments in the birth of the PSM was the setting up of the Kerala Sasthra Sahitya Parishad (KSSP) in 1962. Set up, initially, to communicate science in Malayalam, the KSSP quickly evolved into something much bigger and broader. With its slogan of "science for social revolution" the KSSP evolved into a movement in Kerala that clearly linked the task of spreading "science literacy" with the emancipatory potential of science.

KSSP's pioneering efforts were supplemented later with the formation of the other people's science groups in other parts of the country in the late 1970s and early 1980s. The Delhi Science Forum, for example, (set up in 1979) started active intervention in issues related to science and technology policy, with a view to examining them in the context of their relation to the promotion of progressive polices and their impact on continued oppression by the ruling classes on the common people. Another stream of work that emerged, through the setting up of the IRTC in Kerala and

the Centre for Technology and Development in Delhi, related to working with local artisans and adapting technologies for local needs and in setting up enterprises in which such artisans would be partners. The decade of the 1980s saw a rapid expansion of groups in different parts of the country, such as the Tamil Nadu and Pondicherry Science Forums and the Madhya Pradesh Vigyan Sabha.

The Bhopal Gas Tragedy in 1984 acted as a spark to unite these different groups and in the setting up of other groups in different parts of the country. The efforts culminated in the organisation of the first nationwide science communication programme (the Bharat Jan Vigyan Jatha in 1987) and the setting up of the All India Peoples Science Network in 1988, when 26 organisation come together to form a network with a common vision.

1.2. Expansion through intervention in the Literacy Movement

While the formation of the AIPSN laid the foundation for the building an All India movement, in many parts of the country - especially in Hindi speaking states - the movement was still led and was based on working scientists or science teachers. An opportunity arose to transform this situation with the launching of the Literacy Mission in 1990. The AIPSN had already seen the huge potential for building the science movement through participation in the literacy movement because of the KSSP's active involvement in the total literacy campaign in Kerala from 1988. The Bharat Gyan Vigyan Samiti (BGVS) came into being in 1990, to take forward the task of the Peoples Science Movement to reach out to much larger numbers of people.

The AIPSN today is the inheritor of the vision of people like Bernal, of the dreams of Meghnad Saha and P.C.Ray for a free and self reliant India and of the aspiration of the toiling people of modern India for creation of a country free from oppression, ignorance and poverty. It is a network of over thirty-five People's Science Organizations spread all over the country. Since its inception as a network of activist organizations involved in science popularization and in examining issues related to the interface of science with society, the AIPSN has emerged as a pioneer in activities on science communication and popularization. The PSM's involvement in and the success of the literacy movements and the subsequent integration of several state level BGVS organizations in the AIPSN has significantly increased the reach of the AIPSN. The literacy movements in the AIPSN have now built on the mobilization achieved through the Total Literacy Programme, and includes activities related to continuing education, school education, women's empowerment, credit co-operative movements, rural micro - enterprises, etc. The third major area of intervention by the AIPSN has been in the area of economic, scientific, and technological self-reliance. The AIPSN was engaged in two major communication and mobilization exercises called Hamara Desh (Our Country) and Desh Ko Jano Desh Ko Badlo (Know your Country Save your Country) in the nineties. The Programmes have focused on encouraging local area planning and resource mapping and carried the message of local capability building for self-reliance. Finally, PSM organisations have also been engaged in developing rural artisanal technologies that are capable of replication in different situations and conditions.

2. AIPSN: Key Positions and Concerns

The Peoples Science Movement, clearly emerged by looking at science as an area of social activism rather than merely an activity of the elite, to be conducted in laboratories and institutions. The PSM arose within a critique of capitalism that viewed science and technology as the means to maximising profits (by the constant revolutionisation of productive forces). The PSM, to the contrary, views science as a way to improve the living conditions of the people on the planet. The PSM's view of science is not limited to the physical sciences but extends to all spheres of human activity - thus it includes not just how man interacts with nature but also to how humans interact with each other in society.

The PSM's critiques of the way science and technology affect the lives of people are not a critique of science itself, but a critical understanding of science under capitalism, where its full potential is denied and often misused. In this understanding, the PSM differentiates itself from the understanding of many anti-science groups, who view science itself as a source of exploitation and deprivation of the majority.

The PSM also differentiates its understanding from that of the "rationalists" who view "irrational" behaviour as the root cause of why science is not able to achieve its full potential. The PSM, while recognising that irrational behaviour (in the form of superstitions, irrational beliefs, etc.) does act as a barrier to the spread of science, locates such behaviour in broader societal issues and practices.

The AIPSN and its member organisations, over the last two decades or more have developed capabilities to intervene in different areas. To summarise, they include:

- **Science popularisation** - involving spread of awareness about Science and Technology among the people. These activities have included activities that: de-mystify concepts and phenomenon and making them easy to understand; counter myths and superstitions; explain the social, political and economic contexts of current debates in the area of S&T (viz. the current debate on climate change).
- **S&T Policy analysis** - involving development of critiques about policies that shape the use (or misuse) of Science and Technology.
- **Issues related to Development and Livelihoods** - including areas such as education and literacy, health, gender, decentralised planning with people's participation, maximisation of benefits from state sponsored schemes (such as NREGA, NRHM, RTE, etc.).
- **Alternate models of rural enterprises and sustainable agriculture** - including setting up of rural S&T based enterprises; and promotion of models of sustainable agricultural practices.

One dimension of the PSM's work that has seen some positive development is in the area of gender. A major fillip in this area was provided due to the PSMs' involvement in the total literacy campaigns - where a large part of the mobilisation took place among women. This led to the formation of a platform (SAMATA) to specifically work on gender related concerns.

3. Current Debates that should shape the PSM's Activities and Responses

Since the formation of the AIPSN in 1988, several developments have brought about fundamental changes in science and society relationships. Two sharpening contradictions between the laws of capitalism and the development of science and technology are clear examples of how capitalism is unable to harness the true potential of science, and in facts is starting to act as a fetter on its further development for the benefit of humankind.

3.1. Over consumption under Capitalism and Climate Change

The first pertains to the contradiction between man and nature that capitalism is unable to solve - capitalist growth is premised on ever increasing consumption, which now places an unsustainable burden on the finite resources of our planet. It is a contradiction that threatens the very existence of humankind on the planet. When the AIPSN was born, concerns about the impact on capitalist development on nature was a concern, but it has become a much larger concern in the last two decades. The PSM is required today, to respond to the issues linked to unsustainable development and its consequent role in climate change.

3.2. Private Appropriation of Science

The demands of global capital, mediated through the market, are increasingly driving the trajectory of advances in science. Today this acts as the principal barrier to the advance of science as a knowledge

system that is designed to serve the needs of the people. The needs of a neo-liberal economic order valorises immediate gain as the principal driver of science. Science as an open system is giving away to the logic of the capitalist enterprise, where it is driven by the demands of a private research system, increasingly embedded within the heart of the educational system. Thus, the need to create private monopolies, and not the production of knowledge, is the principal driver of scientific research. Consequently, for example, the output of research is shifting from the production of open publications that enrich and advance science, to patents, that commodify science. At the same time, the demands of the market and the tremendous growth of technology as a source of artifacts means that science is driven by the constant need to generate innovations that can be put on the market as a commodity. Hence, emerging issues related to both production and reproduction of knowledge are important to understand, in order to formulate an understanding of the way in which knowledge, science, and innovation find expression today.

3.3. Production of Knowledge: The Institutional Structure of Science

Classically, development of scientific knowledge resided within the structures of higher education. As these were relatively autonomous of both the state and the market, the system of generating new knowledge was not closely bound by the immediate needs of the dominant classes in society. The university system, thus, was able to retain a sense of independence and self-regulation. Education was seen to have a larger purpose than merely serving capital or the needs of the state. As a result, the educational system also provided a place for contestation - a place where new ideas arose not only in the respective disciplines but also about society itself.

The classical notion of science and technology was part of this overall structure. Science was supposed to produce new knowledge, which could then be mined by technology to produce artifacts. The role of innovation was to convert ideas into artifacts. The system of intellectual property rights arose to provide protection to useful ideas that were embodied in artifacts.

The transformation of this system, that existed for a several centuries, came about as a result of two kinds of transformations. The first, relates to the way in which the university system of knowledge production has been transformed, under the neo-liberal order, into profit making commercial enterprises. Second, the distinction between science and technology has blurred considerably and the two are far more closely integrated. For example, an advance in genetics can, almost seamlessly, lead to an artifact that is both patentable and marketable. Similar is the case of innovations in the field of electronics and communications. Many disciplines of science, as a consequence, are being driven closer to the systems of production.

Today, within the altered system of education, students are regarded as consumers and the university-education system is structured like a commercial enterprise. In such a system of knowledge production, a deeper analysis of nature that has no immediate commercial application, is of much lower priority than what the industry considers as lucrative research. Thus long term knowledge production is devalued in favour of immediate and short term gain. Further, research priorities are shifting away from those that address the needs of society to those that service the needs of people who can pay. The system is increasingly being funded by corporations or by the state working at the behest of corporations. Thereby, science is no longer seen as a way to advance knowledge and the well-being of society but as a means for generating profits for large corporations. . The impact of such a shift is visible. In India, for example, a major thrust in agricultural production in the decade of 1970s and 80s (termed as the "green revolution") arose out of public domain science. Today, the gene revolution is controlled by a few private corporations - and they are seen as the possible drivers of a second "green revolution".

The last two decades have seen the creation of a new category of private property rights called Intellectual Property Rights. The objective of this exercise was two fold. First, it sought to give a cover of individual creativity to legitimise essentially corporate rights. The second was to expand enormously the scope of these rights. The impact of this new IPR regime, coupled with the global trading regime under WTO, has led to the private appropriation on a grand scale of commonly held biological and knowledge resources of society. The patents regime today has expanded to patenting of life forms, genetic resources, genetic information in life sciences, patenting methods and algorithms in computational sciences and even patenting of how business is done. Traditional knowledge and biological resources, held and nurtured by different communities, are being pirated by global corporations. Increasingly, the enterprise of science as a collaborative and open activity for creating knowledge is being subverted into a corporate exercise of creating monopolies and milking super profits from the consumers.

Thus the twin challenges we face today as regards the production of knowledge and the use of this knowledge are: on one hand the destruction of the planet's ecology as a consequence of rapacious use of its resources because of the way capitalism develops and uses science and technology; and the private appropriation of knowledge production and knowledge use. This has given strength to the understanding that science needs to return to its former open and collaborative method of working. This is the understanding that has given birth to the 'commons movement'. The environmental and ecological movements seek to safeguard the physical commons (grazing lands, forests, fisheries, oceans and atmosphere) for the good of humankind against their private appropriation. The movement for knowledge commons, on the other hand, is about liberating knowledge production and reproduction from the clutches of a few rich corporations and rich countries. Never before has society had the ability to bring together different communities and resources, like it has today, in order to produce new knowledge. What stands in the way of liberating this enormous power of the collective for production of new knowledge and designing new artifacts is the monopoly rights and private appropriation inherent in the global Intellectual Property Rights (IPR) system.

3.4. Science, Society and Democracy

Finally, we come to the question: how do we bring back societal concerns into institutions of science. How do we democratise these institutions, so that larger social goals determine the priorities in science? How can diseases that affect the poor become objects of research if the budget is coming from the corporate sector who are not interested in developing medicines for people who cannot pay? How do we bring the concerns of the poorer countries, who have neither the money nor the scientific resources to address their problems? How do we bring equity back into the system of advancing scientific knowledge? This brings us to the larger issue of how society as a whole can exercise control over the enterprise of science. If science today is a major economic force, the larger goal of democracy and equity in society will also play itself in science. It is not surprising that a number of crucial questions in today's world requires an understanding of science. In the absence of this understanding, a few scientists in the ruling establishments place their decisions as the "scientific" decisions for society.

Earlier movements of scientists placed this within the context of the social responsibility of the scientist. The scientists, in this view, owe it to society to be conscious of his or her activities and bring it to public notice. The scientist had this two fold responsibility - understanding the implications of science for society and also becoming an active champion for the right kind of science. The role of scientists in the nuclear disarmament movement is perhaps the most important of this earlier work. The scientific workers movement, the movements for popularising science amongst the people

that developed in the in the 1940s and 50s grew out of this perspective.

Today, the need for organising the scientists to struggle for a more democratic scientific decision making must go hand-in hand with a strong movement for bringing science to the people and, perhaps more importantly, in promoting the role of public participation in deciding how knowledge and science are to be generated and used. If global warming is to be combated or nuclear disarmament pursued, it is not enough for the scientists to say so. There is a need to bring out science from the ivory tower and de-mystify it so that people, who are affected by such decisions can also assert their voice. Science is too serious a business to be left to the scientists, and now corporation – it must be a part of our larger struggle for equity and democracy in society. In a bygone era, when production of knowledge was relatively open and thus relatively free of commercial interests, the state (governments) could be said to have played a neutral role in advancing science and its appropriation. **Today the state has almost abdicated this responsibility and acts as an instrument of global capital and corporate interests. This is the special role of the Peoples Science Movement today, more so than when the AIPSN was born. The primary role of the AIPSN, thus, is to rescue science and technology from the clutches of global capital and make it available for the good of humankind.**

4. PSM's positions vis-a-vis some responses to the crisis in Science and Technology

It is not as if there have not been responses to the crisis within science and technology as we have discussed above. It would be useful here to discuss some of these responses.

One set of responses has starts from the premise that big science and big technological interventions lie at the heart of the problem in science and technology. Another set of responses propose that 'Western' science is at fault and we need to find our solutions in 'our own' traditional sciences. Many of these responses also start from a critique of capitalism and they find a resonance in India through several, what are called, 'civil society organisations'. There would be occasions when the AIPSN would make common cause on specific issues with such organisations. At the same time, many of these organisations are also hostile to left and democratic organisations and often take an anti-science position, of the kind that we have discussed earlier. It is, thus useful to discuss here, how the PSM's positions differ from that promoted by several NGOs and social movements (i.e. movements that are generally issue based and seek not to align with any political ideological position - they are ambiguous in their critique of capitalism and in viewing socialism as the alternative to capitalism).

4.1. PSM's position on perceived contradiction between "Western' science and 'traditional science'

Like all ancient civilizations, India has a rich heritage of traditional knowledge. Much of this heritage stands at the doorstep of becoming extinct or has already become so. Attention has recently been focused on a few cases of traditional S&T practices - such as steel making in Bastar or use of rare herbs in Kerala. This apparent revival in interest regarding traditional practices is linked with attempts to Patent such practices - often by foreign entities - and concerns related to measures to safeguard them.

While any attempt to take a close look at this fast dying heritage should be welcome, it is also true that an interest in a few high profile cases may not amount to a cogent policy towards traditional knowledge and practices. The Indian countryside is replete with instances where artisans make use of empirical knowledge, that has a history of thousands of years. Yet, often, the attitude to such knowledge has been fraught with two contradictory kinds of dangers. One attitude is to ridicule traditional knowledge and practices, while the other attempts to glorify it. Both, viewed objectively,

result in contributing to its ultimate demise.

Disdain Towards Traditional Knowledge: The first view is disdainful of all traditional knowledge and practices and mechanically seeks to introduce new technologies to replace existing practices. In the process a lot that is useful, and draws upon local wisdom and resources is irretrievably lost. Ultimately, what is introduced may turn out to be disastrous for the local ecosystem and entirely alien to the needs of the local community.

The recent spate of droughts in the country has focused attention on the fact that the disruption of traditional methods of water harvesting has led to a dangerous situation. In parts of Haryana and Uttar Pradesh the water table has risen as a result of intensive ground water withdrawal, leading to dangerous levels of salinity of the soil, because of the disruption of natural drainage channels. Introduction of mono-cropping along with new agricultural inputs has replaced coarse grains in vast tracts of India with cash crops like tobacco, cotton and sunflower or with "high value" grains like rice and wheat. As a consequence the staple diet of the poorest in rural India, which is to be constituted by coarse grains, has been disrupted and they are forced to buy wheat or rice from the open market at very high prices. In the artisanal sector traditional pottery, leather tanning, blacksmithy, etc. have withered away in the face of competition from industrial modes of production. Traditional artisans - usually the natural carriers of traditional knowledge - have been reduced to penury or forced to give up their trades and exchange them for unskilled work in sweatshop conditions. It may, of course, be argued that the pauperisation and conversion to urban proletariat is a natural consequence of capitalist development. While the argument is valid, it needs to be underlined that even under capitalism, the total marginalisation of the existing knowledge base is not a necessary consequence.

Hierarchical Division in Traditional Science: One of the reasons for the inability of traditional knowledge to survive in India is also related to the way knowledge systems were organised in traditional societies. With the increasing stranglehold of the caste system, most trades came to be associated with specific castes. Thus knowledge in trades like pottery, leather, weaving, blacksmithy, etc. were practiced according to a strict caste-based division of labour. The division was further compounded by the notion that "intellectual" pursuits are the "highest" form of human endeavour, while tasks requiring manual skills are to be considered as menial pursuits of the "under-castes". There was thus a tendency towards the disjuncture between science and technology - the former being seen as a domain of the upper castes and the latter being pursued by the "lower" castes. This, for example, led to a rich harvest in the theoretical branches of science - mathematics, astronomy, etc. but a very poor record in the development of mechanical artifacts that had everyday practical application. There was a societal disdain towards any form of activity that required mechanical skills - in other words all forms of artisanal trades. Thus, for example in medicine, Ayurveda was privileged as a science to be practiced by the upper caste vaidyas while surgery and midwifery were the domain of the "lower" castes. This kind of a hierarchical division led to the stagnation and mystification of traditional knowledge in India.

The Revivalist Approach: Today, the real carriers of much of traditional knowledge are the "under-castes", whose wisdom has for centuries been undervalued. It is in this context that the second, contrary, approach to traditional knowledge is to be viewed. This approach attempts to "revive" traditional knowledge and practices in their pristine purity, and abjures any "contamination" of these by present day practices of science and technology. Such an approach is as damaging as the first, because it seeks to perpetuate unsustainable practices and deny people benefits of recent insights and advances in Science & Technology. Such attempts are unsustainable also as they do not address the inherent asymmetry that existed in the organisation of knowledge systems. Today, while

on one hand caste barriers are being broken down, an attempt to resurrect a traditional knowledge system in its "pure" form is an anachronism. The traditional vaidya flourished under court-patronage, the traditional potter was allowed to ply his trade after paying the landlord in kind, the traditional tanner was given the right to use the hides of fallen carcasses in exchange for footwear supplied to the landed gentry.

Traditional knowledge withered in India not because it was overrun by modern science, but because in many cases its natural carriers were the most marginalised in society. Revival of traditional trades and the associated wisdom, would hence require efforts to privilege these trades with social prestige. This can be done not by merely spouting swadeshi, but by infusing modern technology that builds upon traditional skills.

An important underlying philosophy of the "revivalist" approach is to view present day science and technology as "Western", and thus alien. What is forgotten is that modern science carries with it the heritage of knowledge of the whole of humankind, dating back to the earliest civilizations of Egypt, India, China and Mesopotamia. The first effective drug against malaria drew upon the traditional practice of ancient communities in the Amazonian jungles. The concept of zero, without which the present day communication revolution would not have even started, draws from mathematics in ancient India and China. Instead of highlighting this heritage of modern science, what is sought to be built up are mere myths regarding the "golden age" of Indian science that supposedly boasted of space travel and nuclear fission, among other similar accomplishments! They, thereby, end up by handing over the entire heritage of modern science to the West, as though what we see as modern science was developed ab initio in the latter half of the last millennium in Europe. Interestingly, this is also precisely the view that Europe would have us believe. This is manifest in their effort at tracing much of the heritage of modern science to Greek science, and denial of the contributions made by science from Egypt, China, India, Mesopotamia and Arabia.

Some, so called, radical practitioners of the revivalist philosophy have extended the notion of "Western" science by dubbing modern science as inherently violent and anti-people. They conveniently lay all the ills of capitalism at the doorstep of modern science, and in the process trivialise and demonize thousands of years of human endeavour - for the latter is the true claimant of what we call modern science today. Such a philosophy is dangerous because it tries to incorporate an inherently revanchist understanding of society within radical slogans. In order to secure the core of traditional knowledge that still exists in the practices of a large number of practitioners it would be necessary to rescue it from both the contradictory trends described above. If the intent is to draw the best out of traditional knowledge and harness it to address people's problems, an open approach is necessary that is neither disdainful of it, n or suspicious of modern science. Anything else does justice neither to tradition, nor to science!

4.2. PSM's view of Decentralised S&T-based Development

There are, and have been, several approaches towards the complex of activities embracing rural development, appropriate technology and decentralized or micro-level enterprises. Each approach is, of course, not merely an operational prescription or methodology but is inspired by, and is an expression of, a perspective, a theoretical framework, an ideology.

The PSM, over the last two decades, has been engaged in activities to set up rural S&T-based rural enterprises of varying sizes and also in interventions related to sustainable agricultural practices. Several PSM member organisations, such as CTD, IRTC, CERD, FOSET, MPVS, etc. and SHG based organisations have been involved in such activities. The PSM needs to be clear about the understanding based on which such activities are being conducted.

These endeavours are aimed primarily at creating models rather than at generating and running economy-wide systems. At the same time,, however, these models are not simply to be isolated experimental show-pieces, but seek to survive in the existing economy and, may, through networking actually become quite large and competitive entities. Yet the aim at present remains model-building rather than system building. In this sense, as well as in the more general conceptual sense, we are therefore *not* setting up 'parallel systems' which, competing with the existing one, would eventually establish their dominance and take over.

So, if these endeavours of ours are to be seen as 'models' what are they models of? And what are they for? In the present socio-economic-political context, these models serve many ends. In the first place, they serve as an 'alternative' to existing schemes and models of rural development, poverty alleviation, employment generation and upliftment of weaker sections. These models, in themselves and if replicated widely, would provide improved benefits to the weaker sections compared to conventional rural development programmes and make accessible certain forms of employment/ income generation usually availed of only by better-off entrepreneurs. They may also serve as exemplars, as viable options, for other artisans or other workers with some models entering the wider economy as such. Such models may also directly prove useful to, and may be adopted by, sensitised government departments.

These models are not merely disembodied pieces of hardware or machinery. They also have, as important if not crucial elements, an organizational element involving groups of artisans and other workers, if not in actual group-organized production collectives at least as 'carriers' of the new technology thus having a stake in these. Thus while providing relief to these sections these models also expose them to new ideas, including elements of consciousness built-in to common work-places with division of labour (industrial forms of production rather than individual household-level production). Our models also therefore provide an organizational platform for consciousness-raising, as a powerful (if large and networked) lobby for different and more empowering developmental programmes/strategies. It is possible that some models may even emerge as new types or forms of rural industries, vibrant new 'bases' for S&T in rural areas, especially with our concept of S&T Field Agencies with linkages with S&T Institutions. In this way, our models may make a significant contribution and act as a driving force for significant change.

In our conception, we differ from the 'small is beautiful' understanding that is promoted by many Western and Indian groups. These latter look at small enterprises as stand-alone systems that would multiply and replace existing systems of production. The PSM does not share this understanding of autarky or village self-sufficiency, where every village can sustain itself through the use of such small and "beautiful" models. Nor do we believe that these models will be premised only on traditional knowledge - rather we believe that such models must be able to utilise the most recent advances in science and technology, and that networking of distributed enterprises will enable the emergence of large systems as alternatives to the conventional large and centralised units. Networked distributed enterprises can thus be a contemporary, high-tech and yet employment intensive and low-entropy alternative system.

In other words, we do not believe we are looking back to some 'good old days' or just interested in reviving old traditions. Rather, we believe we are on the cutting edge of contemporary reality, meeting tomorrow's needs of rural India today, and in a way that need not mean an inevitable repetition of the Western-industrial-capitalist model.

5. Organisational and Conceptual Issues that need to be addressed

We can today see how the Peoples Science Movement has, broadly, developed through two "waves" of activities. The first wave of science popularisation and policy related activities and the

second wave of activities since the 1990s through the PSM's involvement in the literacy campaigns. This expanded the reach of the PSM, and gave rise to new organisations, especially in Northern and Western India. It also focused attention on a different set of issues and interventions, which can broadly be called developmental issues. They included areas such as education, health, agriculture, right to food, gender empowerment, etc. Almost all AIPSN organisations today have a mix of activities that address both these broad kinds of activities. These two broad sets of activities, it must be emphasized, are not in contradiction to each other. In fact there is a large potential for them to complement each other.

However there are important differences in the mode of taking these issues forward, the kinds of activists that are drawn to each and the capabilities necessary to address them. In the case of S&T based activities, target audiences are often in schools, colleges and institutions. Capabilities required include some grounding for activists in the sciences, a basic understanding of technology and science. Typically therefore, leading activists in this area have been science teachers, students and those drawn from S&T institutions. In the case of developmental issues, the audience is largely community organisations, often at the panchayati level. Capabilities required for such work include a strong social base within communities. Typically activists drawn into these programmes have been youth and women from the community.

While conceiving All India programmes, the challenge before the AIPSN is to develop initiatives where everybody has an interest. This is not always easy given the contrasting nature of immediate concerns and the capabilities of activists. This is a challenge that the AIPSN needs to address, and ensure that the two different streams complement each other, and do not act as competing interests. This would also need AIPSN organisations to develop capabilities in areas where they lack them, largely through learning from each other.

As is natural, constituent organisations of the AIPSN have a large variety of activities that are specific to their own situations and conducted by the individual organisations. An inventory of such activities would show that AIPSN organisations, collectively, are involved in a very large number of activities. Unfortunately, only a small percent if this gets translated into co-ordinated activities that are conceived and seen as AIPSN activities. For this to happen, constituent organisations have to invest more in the AIPSN.

Increasingly it is becoming clear that Govt. agencies are largely uninterested in supporting innovative initiatives such as those pursued by the AIPSN. While there has been an actual expansion in the amount of Government support that goes to NGOs, such support is largely for Government programmes, that are pre-conceived. NGOs are seen as implementers and not innovators and movements such as the PSM do not generally fall within the overall scheme of Govt. support any more - a shift from two decades back when programmes such as the BJVJ and Total literacy programmes were seen by the government as important enough to support and nurture. Such a shift links with the intolerance of neoliberal policies towards initiatives that fall outside the neoliberal framework. In such a situation it is necessary for the AIPSN to look for different ways of raising resources and of conceiving programmes that can be non-funded or supported through community support. At the same time the PSM needs to continue its efforts to source Govt. funding, based on our understanding that such support comes from people's money and we have a right to ask for such support for activities that address concerns of the people.

There are other issues that have emerged in different parts of the country as we continue to grow. While many PSM organisations receive support from Government agencies, we continue to be unfailingly critical of many policies of the government. Do we see this as a contradiction or can we reconcile the two? In some regions we also have a debate about the central role of the PSM.

Should we limit the PSM's role to awareness raising and engaging in "constructive" activities. Or is the PSM's basic purpose also to challenge the present social and economic system and seek radical transformation? If that is a central role that the PSM is to play, how well is the PSM equipped - ideologically and organisationally - to actively oppose and agitate against entrenched interests in the social and political spheres.

There are no ready answers to all these challenges we face and the questions that are beginning to arise. Perhaps there is no one solution in all parts of the country. But these are issues that we expect we shall debate in Thrissur at our Conference.

I would like to end with some proposals that the AIPSN needs to consider, in order to address the challenges we face and the future that we seek to build for the Peoples Science Movement.

AIPSN's tasks in view of the present political context:

- Develop innovative ways in which to spread an understanding about science and its potential to change peoples' lives, make it easier to understand our physical and social environments, and act as a driver of social transformation;
- Sharpen our critique of neo-liberal policies, especially as regards the impact they have today on the private appropriation of the fruits of science and technology
- Develop a better analysis, based on scientific principles, about how social and political factors impact upon both creation of knowledge and its access to large sections of the people
- Fight the anti-people science and technology policies of the neoliberal state; and at the same time fight the anti-science populism of the NGOs and 'civil society' groups
- Expose the inherent anti-science content in sectarian politics based on religion, caste, etc.
- Include gender in all aspects of our work and not view it as a task that is to be undertaken only by SAMATA
- Work to maximise access to knowledge, resources and technology in the present socio-economic framework, with a view to providing immediate relief;
- Develop alternatives that are outside the neo-liberal framework, and agitate and mobilise around them
- Deepen our understanding of what constitutes development that is sustainable and equitable
- Build better links with other democratic organisations that base their activities and programmes within a critique of capitalism and neo-liberalism, and also have an interest in fighting for an alternate system that is based on the principles of socialism

How are these tasks to be realised? Being a network with different capabilities in different organisations, there is a large diversity in the mix of activities that individual member organisations of the AIPSN undertake. The differences regarding organisational strengths, capabilities and interests have also defined how individual organisations see their major role. Some organisations see their main strength in being able to provide expertise to the democratic movement, and help them to arrive at an understanding about issues related to Science and Technology. Others see their role as one of being an interface between the organisations of mainstream S&T and development and the poor and marginalised people. Still others see their principal role as being one of creating a counter hegemonic force, i.e. of questioning the present dominant status quo and proposing as well as mobilising for alternatives. To summarise, activities of PSM organisations are at three levels:

1. Providing critical anlysis of issues of S&T to support the democratic movement
2. Maximising the uptake and access to S&T among people

3. Mobilising to create alternatives and to agitate for such alternatives

It is not possible create a hierarchy of these modes of working, i.e. to suggest that one is superior to the others. Many organisations use more than one, or all three modes. What can perhaps be suggested is that organisations aspire to build capabilities so as to be optimally effective in all three modes of working.

Let me end with one issue and a linked suggestion. In order to be able to undertake meaningfully the tasks that we set ourselves, we need to also consider the organisational form of the AIPSN. The AIPSN is *both* a network and a movement (which we call the PSM). The requirements as regards the two can be different. As a *network* the AIPSN needs to be sensitive to the needs of member organisations, who may come with different experiences, strengths and weaknesses. The challenge is to balance the differences in capabilities and expectations, while ensuring that all AIPSN organisations find a way to contribute and feel confident that their views are heard and respected. Given the large diversity among the partners this is not an easy task. As a *movement* the AIPSN (or PSM) is often required to take positions and react to immediate concerns. It is also required to present a concrete strategic vision on many issues. Such requirements require decision making structures that are capable of taking quick decisions that best reflect the consensus within the constituents of the movement.

For the AIPSN to fulfill both its organisational mandates - a Network and a Movement - we need to devote more attention to the organisational challenges that the AIPSN faces. Being a Network and not an organisation in the classical sense, how the AIPSN functions is very largely dependent on how the constituent organisations see the AIPSN and how much they are willing to invest in the AIPSN. Over a period, various attempts have been made to decentralise the organisational structure of the AIPSN - specifically by creating 'desks' or 'sub-committees' that are responsible for specific thematic areas. In the past few years we have also experimented with specific organisations being given the responsibility for specific sub-committees. Our experience in this regard has been mixed, and there is still a large gap in the willingness of member organisations to take up some responsibility in co-ordinating specific aspects of the AIPSN's activities. Thus, on one hand, while as a member organisation we have expectations of the AIPSN, it is also necessary that we consider how we can provide greater organisational support to the running of the AIPSN. All member organisations are financially and organisationally independent of the AIPSN. The only binding force is a political commitment to shared values and aspirations. We need to collectively reflect to what extent we value this shared commitment, and if we do, how we can contribute to the strengthening of AIPSN as a collective reflections of our commonly shared values and aspirations.

People's Science Movements, Practice and Challenge of Mobilization of "Science for People"

Dinesh Abrol

Introduction

In industrialized countries deliberative approaches, lay public participation and counter-public formation already form part of the processes of institutionalized governance of science and technology (S&T). Notwithstanding their cultural differences the scholars of science, technology and society (STS) field have developed an understanding of how the contribution and impact of all these processes on the governance of S&T is getting possibly shaped in industrialized countries (David Hess, 2010). In India too, the system of governance of science and technology (S&T) can now be expected to become a critical factor in the process of promotion of S&T and innovation for development. Social movements have begun to knock the doors of system of governance of S&T in India. Political commentators are already talking of how the country needs to be saved from the neo-luddites and anti-science groups emerging in India. However, the truth is that the developments taking place in the context of decisions to be made with regard to genetically modified (GM) seeds and nuclear power indicate far more the point that India is gradually witnessing now the formation of "scientific counter publics". The emerging divides of knowledge politics will show upfront increasingly in India. The political-bureaucratic apparatus, S&T community, social movements, political parties, all will be compelled to rethink on their ideological heritage and struggle for the changes in the national practice of governance of S&T.

Although the Peoples' Science Movements (PSMs) have an experience of tackling the knowledge divides, it is to be noted that the emerging knowledge divides are now coming upfront at a time when the governments have become neo-liberal in their approach to the promotion of S&T for development in India. Transnational corporations of foreign and domestic origins have been able to gain control over the introduction of a large number of new and emerging technologies.

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Applications of the new and emerging general purpose technologies (GPTs) are being developed in an environment of not only weak environmental and social regulation but also in terms of control and ownership their adoption and diffusion is dependent on how profitable they are for the big business. Controversies surrounding the introduction and diffusion of "Bt brinjal" and nuclear power units bear the stamp of both the neo-liberal governance as well as the divides of knowledge politics that now exist due to the failure on the part of the social movements to articulate alternative pathways for the promotion of development.

During the period of late seventies and early eighties the Kerala Shastra Sahitya Parishad (KSSP), which has within the peoples' science movement (PSM) the status of not only the most important founder organization but also an organization which has been retaining quite well the mass base till this day, was literally alone in raising the issue of environmental impacts of the silent valley project. Today in a large number of states the activists of peoples' science movement are now organizing the protests taking place against "Bt brinjal" and nuclear power. This time the left parties are also far more supportive of the protests taking place against the hurried introduction of "Bt brinjal" and imported nuclear power. At the time of the controversy on silent valley project the left was vertically divided in the state of Kerala, and at the all-India level the Communist Party of India (Marxist), the main left party was leaving the resolution of the issue to the Kerala state committee.

Clearly even the PSMs will have to take up the challenge of emerging divides of knowledge politics to avoid the repeat of the events that the left faced at the time of the debate on Silent Valley project. At the ideological level this challenge is required to be taken up because there are clearly issues also connected with the mixed experience of a) the introduction of new and emerging technologies through the 'Indian state sector' and b) the failure of the Socialist States in Soviet Union and China to provide an alternate system of governance of S&T to take care of the ecological and social impacts related to the adoption of new and emerging technologies. There is also the challenge borne out of neo-traditional politics of identity, which is rooted in the influence of the factors like elite formation, dispossession and post-modernism. PSMs will have to use the practice of mobilization of science for people to unite the people who remain also divided on the basis of the factors of caste, ethnicity and religion. With the challenge of creation of a counter-hegemonic influence seeking also the attention of progressive and secular political tendencies it is clear that the PSMs will have to play their due role and use the tools of educational and developmental actions.

PSMs have come to mobilize over the period all sections of the Indian people for a multi-dimensional public engagement with science and technology (PEST). This multi-dimensional engagement has made the PSMs to emerge as mass movements in quite a few states in India. The movements incorporate and are led by the activists whose socio-cultural backgrounds are have come today themselves from diverse sections of the people. Significant changes are visible at the level of both the agency as well as the structure of peoples' science actions. Today the PSMs are in position to target far beyond the S&T community. PSMs are targeting a diverse set of constituencies. Their immediate interests, capabilities and ethos are the starting points for the constitution of the repertoire of actions. As a result the changes have been made and more experiments are required to be made at the level of the strategies for coalition building. New repertoires of actions are required to be developed to keep the coalitions and move towards the development of S&T for sustainable human development. Changes are required at the level of the ideology of S&T, technological imagination and socio-technical frames under use for innovation making. Therefore, the potential impact of PSMs is connected to the development of alternatives to take care of the challenges arising out of not only neo-liberalism but also the change being experience in the structure of the movement.

While it is certainly quite difficult to predict how far the PSMs or the left or anybody else within the political spectrum will change their ideology of S&T, repertoires of action, processes of capability development and strategies of coalition building, but it is certainly possible for the scholars of science, technology and society (STS) and political sociology to understand the historical connections and dynamics of the situation evolving at the level of both, ideology as well as repertoire of actions and strategies of coalition building. In this article the practice of peoples' science movements (PSMs) in terms of all the above said aspects is examined in a historical and comparative perspective. Focus is on the implications of the historical connections of the changes in practice and the nature of changes that will have to be made in the agency, structure, processes and strategies under use in the near future for the mobilization of 'science for people'.

Historical connection of the efforts for 'science in mother tongue'

The relationship between science, technology and the public has undergone significant changes over the last three centuries. In the 17th and 18th centuries, the public played an important role in legitimizing science itself.[1] In the second half of the 19th century, popularization activities intensified throughout the world. In many dependent countries, such as India, there emerged a process of vernacular education, where by local popularisers translated foreign texts and produced regional periodicals in the local language. Popularization of science was conducted by scientists who had studied in European countries and tried to reproduce the mechanisms of transfer of scientific ideas and values. By the late 19th century this very strand had led Master Ramchander and many more to "communicate" science to large numbers in vernacular in India. This kind of encounter has already been analyzed by scholars of history of science in India. Initially such initiatives were often limited to attempts at simplifying scientific concepts, so as to make them better understood by common people. Their attempt was to communicate to people, not just scientific concepts or theories but its value, utility, methods and way of working. These attempts were justified to make it easier for the institution of science to play a greater role in peoples' lives and thereby promote development. But it is also true that all of these interlocutors were compelled to demarcate the domains of science and faith (Irfan Habib, 2008).

Regarding the aims of popularization of science in pre-independence India, Dhruv Raina (2004) characterizes the efforts emerging from these scientists during the period of 1850-1920 as largely being fractured between the instructional frame (since it also had to meet a growing professional demand), and the evangelical frame which sought to win over as many as converts to modern science so as to reinstitute a novel enchantment with the world. This particular genre was replaced by the expository genre of science writing in the popular idiom. Earlier efforts seeking to read the traditional in the light of the modern; however these became rare after the 1930s. After 1914, scientists in India were choosing problems from a global basket. Particularly with the inauguration of the era of big science and the intensification of India's efforts to freeing herself of the yoke of British rule, as other stratifications came to mark the science-society relationship, additional interlocutors were inserted into the hiatus that separated science from its public-the historian of science and the science communicator. However, it will also not be incorrect to suggest that initially the creative aspiration of the rising classes and later the democratic impulse of nation building were the drivers of the efforts for science popularization.

[1] The experimental philosophers assigned the general public the role of non-specialized witnesses to experimentation: experimental science, at its inception, required and presupposed, in order simply to exist and be accepted, the group of witnesses. Afterwards, the presence of the public witness was replaced by the publication of science articles in specialized periodicals which, in cognitive terms, are only available to specialists. With this we see the progressive role.

Historical connection of the peoples' oriented practice of 'science for nation'

A significant part of the efforts of PSMs have also been carried out with the aim of fighting for a peoples' oriented mobilization of 'science for nation'. This connection was created by the interlocutors who did not carry colonized minds and were interested to reconnect science and public in a nationalist, democratic and progressive frame of S&T cultivation. Enakshi Chatterjee brings out the diversity of these influences while discussing the characteristics of science popularization as very well undertaken by Meghnad Saha and Stayen Bose in Bengal right through the thirties, forties and fifties. While identifying the areas of concern, Enakshi chatterjee writes "Saha was more concerned with what he had to say, the content, not so much with the language. National issues, he felt, needed to be communicated to the people (Enakshi chatterjee, 1990). In the efforts of PSMs, as the care was taken to focus on the content and the language together, one can see the direct influence of the left and democratic agenda only growing over the period.

From the 1930s onwards the popularization of science movement experienced an important moment of translation connoting the creation of a link that the freedom movement inserted by defining the two most important historical tasks for whose realization the struggle is going on even today. The first task which the freedom movement invented can be characterized as the challenge of cultivation of science for nation. This challenge seeks the implementation of appropriate initiatives for the achievement of goals of self-reliance and inclusive development. The second task which the freedom movement again only inserted has been characterized as the challenge of promotion of science in mother tongue and national languages.

During the formative period of forties and fifties, when the precursors of PSM were already beginning to emerge in some parts of the country, there was also a clear example of the positive impact of the efforts of socialist state to link the endeavour of science with the process of national development[2]. It was also the time of emergence of the path breaking work, "The Social Function of Science" published by J.D Bernal in 1939. Bernal had developed a framework of understanding science and its effects on peoples' lives in the context of class divided societies. The forerunners of PSMs were influenced largely by the works of Bernal and other colleagues such as J.B.S. Haldane. These works had succeeded in shifting the focus away from merely communicating science to the lay public, to a process where people can participate in deciding how science should be utilized to liberate them from the generally poor conditions in which a majority of them were forced to live. Before Bernal, the mode of interaction between science and the people was based on a simplistic model. In such a model, scientists were supposed to develop and transmit "genuine" knowledge; while the people just received the knowledge. Science popularizers were meant to communicate simplified versions of this knowledge to people.

Notwithstanding the beginnings made with the men of science, the practice of PSMs grew under the influence of the heritage of the national movement for independence. Thus, right from the start the Peoples' Science Movements (PSMs) grew out of a progressive conception of science communication in India. Since the motivations of the early efforts of all those whom the peoples' science movements treat as their inspiration are traceable to the above defined historical backdrop of the need to decolonize science it is necessary to take the name of the "science and culture" group. For an evaluation of the ideology of 'Science and Culture' group see Dinesh Abrol (1995) where the role of "Science and Culture" group is examined in the context of development of the conception of 'science for nation" in India.

[2] While the creation of the first Socialist state in 1917 stimulated people to look at human society in different ways, and this included the role that science plays in society, the activities and initiatives of this movement did serve the peoples' science movements movement well in the early period of post-independence movement.

The PSM's conception of how science and the mass of people actively need to engage with each other was progressive for its times. Meghnad Saha and P.C. Ray saw the potential of science not in the way the British colonizers saw the use of S&T. Modern S&T were a way to emancipate people from drudgery and oppression. Especially in Bengal the PSM draws it heritage from the science clubs that had tried combining the liberating potential of science with the awareness that science can thrive only among people who are truly free. Even today the legacy of freedom movement is alive in the formation of its initial character & origins in the form of Paschim Bengal Vigyan Parishad, an organization of teachers which pursues science in vernacular/ mother tongue, misuse & abuse, policy critiques, active shaping of S&T in the interest of people.

Evolution of the practice of mobilization of 'Science for people'

A direct consequence of the adoption of this progressive conception was that leaders of the PSMs had a strong desire to demystify science. Their practice of mobilization of science for people targeted the training of enthusiastic, ordinary persons in science communication effort. In many parts of the country leaders of the peoples' science movement do not fit the conventional definition of a science communicator or a "scientist" undertaking science communication as a part of the job. A village teacher, a working mother, women, youth and students – all of them form the PSM along with scientists and scientific workers.

A defining moment in the birth of the PSM in India belongs to the setting up of the Kerala Sasthra Sahitya Parishad (KSSP) in 1962. Set up, initially, to communicate science in Malayalam, the KSSP quickly evolved into something much bigger and broader. With its slogan of "science for social revolution" the KSSP evolved into a movement in Kerala that clearly linked the task of spreading "science literacy" with the emancipating potential of science. Scholars also correctly credit KSSP for the successful creation of India's first important mass environmental action; KSSP took up the campaign on the impacts of Silent Valley hydro power project when very few were willing to take notice of the second order consequences of the development process for biodiversity.

KSSP's pioneering efforts were supplemented later with the formation of the other peoples' science groups in other parts of the country in the late 1970s and early 1980s. In 1975, set up during the year of promulgation of emergency, the Delhi Science Forum (DSF) began active intervention in issues related to science and technology policy with a view to examining them in the context of their relation to the promotion of progressive and democratic politics in India. Another stream of work that emerged, through the setting up of the IRTC in Kerala by the KSSP and the Centre for Technology and Development by the DSF in Delhi, related to working with local artisans and adapting technologies for local needs and in setting up enterprises in which such artisans would be partners.

The decade of the 1980s saw a rapid expansion of groups in different parts of the country, such as the Tamilnadu and Pondicherry Science Forums and the Madhya Pradesh Vigyan Sabha. The Bhopal Gas Tragedy in 1984 acted as a spark to unite these different groups and in the setting up of other groups in different parts of the country. The efforts culminated in the organization of the first nationwide science communication programme. The Bharat Jan Vigyan Jatha was organized in 1987 as a nationwide people's science road show for creating scientific awareness and science popularization. Four caravans moving from the four corners of the country, traveling about 2000 Km. converged into a major science rally in Bhopal. In February 1988, after the Bharat Jan Vigyan Jatha when 26 organizations come together to form a network with a common vision, the All India Peoples' Science Network (AIPSN) was formed at the first All India Peoples Science Conference that was held in Kannur, Kerala. Today AIPSN is a network of over 40 organizations spread all over India which define themselves as constituents of the Peoples Science Movement.

PSM expansion through intervention in the literacy movement

While the formation of the AIPSN laid the foundation for the building an All India movement, in many parts of the country – especially in Hindi speaking states – the movement was still led and was based on working scientists or science teachers. An opportunity arose to transform this situation with the launching of the Literacy Mission in 1990. The AIPSN had already seen the huge potential for building the science movement through participation in the literacy movement because of the KSSP's active involvement in the total literacy campaign in Kerala from 1988. The Bharat Gyan Vigyan Samiti (BGVS) came into being in 1990, to take forward the task of the Peoples Science Movement. Should the PSMs reach out to much larger numbers of people through the Total Literacy Programme was extensively debated in the network in Bhopal and Pondicherry?

Discussion was on the aspects like the rationale of joining hands with the government to create BGVS, on the scope and nature of total literacy campaigns & the type of institutions and capabilities that PSMs would need and the opportunity costs that would have to be incurred in relation to the impact on other programmes of science and technology application and organization of the people for access to education, science and technology. Although the network agreed to undertake a Bharat Gyan Vigyan Jatha (a nationwide literacy building campaign with the slogan "literacy and science for the people", the debate remained alive in other forms like dependence on funded project, insufficient focus on science literacy, impact of the involvement of activists with administration and bureaucracy and scope of capability building. This jatha covered over 36,000 villages, and formed nuclei to initiate total literacy campaigns in over 300 districts of the country. More than five lakh of volunteers were involved in the organization of total literacy campaigns. Volunteers were successful in involving over a crore of learners among whom women constituted the majority. This campaign took place at the time when the Babri Masjid movement of the BJP was at its peak.

The literacy movements in the AIPSN have now built on the mobilization achieved through the Total Literacy Programme, and includes activities related to continuing education, school education, women's empowerment, credit co-operative movements, rural micro – enterprises, etc. The third major area of intervention by the AIPSN has been in the area of economic, scientific, and technological self-reliance. The AIPSN was engaged in two major communication and mobilization exercises called Hamara Desh (Our Country) and Desh Ko Jano Desh Ko Badlo (Know your Country Save your Country) in the nineties. The Programmes have focused on encouraging local area planning and resource mapping and carried the message of local capability building for self-reliance. Finally, PSM organisations have also been engaged in developing rural artisanal technologies that are capable of replication in different situations and conditions.

Rarely the common people have been seen as integral part of science movements. The Peoples' Science Movement is in some ways a distinct phenomenon with very few parallels in the rest of the world.

Changing character of the agency and the implications for capability development and repertoire of actions

The AIPSN and its member organizations, over the last two decades or more have developed capabilities to intervene in different areas. To summarize, they include: Science popularization – involving spread of awareness about Science and Technology among the people. These activities have included activities that: de-mystify concepts and phenomenon and making them easy to understand; counter myths and superstitions; explain the social, political and economic contexts of current debates in the area of S&T (viz. the current debate on climate change); S&T Policy analysis – involving development of critiques about policies that shape the use (or misuse) of Science and

Technology; activities related to Development and Livelihoods – including areas such as education and literacy, health, gender, decentralized planning with people's participation, maximization of benefits from state sponsored schemes (such as NREGA, NRHM, RTE, etc.) and the development of alternate models of rural enterprises and sustainable agriculture – including setting up of rural S&T based enterprises; and promotion of models of sustainable agricultural practices.

Literacy campaigns have rewarded the network with the capacity to organize mass activities that followed in the form of organization of "Joy of learning" (a campaign to make teaching of science a matter of joy in the learning process), the total solar eclipse which provided an opportunity to add the element of Cosmic Voyage Programme under which campaigns were launched to enable children to see the solar eclipse safely through filters and also discover the wonders of the sky. Building and developing on literacy programmes the network went on to implement health intervention across the country in the form of Jan Swasthya Abhiyan (JSA). Today the network is involved in the publication of journals & institutions, schools undertaking formal and non-formal science education activities.

The members of PSM network are maintaining state wide technology implementation resources & networks to develop and disseminate appropriate technologies across sectors. The resources of these institutions are now devoted to undertaking the implementation of upgraded rural artisanal technologies for rural non-farm activities and developing technologies of sustainable agriculture. The network is devoting a lot of its resources to develop peoples' capabilities for intervention in the health policy and programmes. Efforts are on to strengthen the interventions of network members in the sphere of education, interventions in the democratization of panchayati raj through the implementation of peoples' planning, natural resource literacy programmes, watershed development programmes, climate change and environmental protection campaigns.

PSM interaction with society and state has spanned the areas of

- Using science to demystify claims of God Men or superstitions,
- Using functional literacy programmes for the development of reasoning, awareness & outlook
- Evolving educational tools for making the study of science a joy of learning
- Critiquing the misuse of S&T for destruction - economic, ecological, warfare etc.
- Struggling for the access to health and sanitation
- Finding technological application to problems faced by rural artisans - improving peoples' skills through the upgrading of their scientific & technological knowledge

Today the AIPSN is the main inheritor of the vision of leaders like Bernal, of the dreams of Meghnad Saha and P.C.Ray for a free and self reliant India and of the aspiration of the toiling people of modern India for creation of a country free from oppression, ignorance and poverty. It is a network of over thirty-five People's Science Organizations spread all over the country. Since its inception as a network of activist organizations involved in science popularization and in examining issues related to the interface of science with society, the AIPSN has emerged as a pioneer in activities on science communication and popularization. The PSM's involvement in and the success of the literacy movements and the subsequent integration of several state level BGVS organizations in the AIPSN has significantly increased the reach of the AIPSN. Today, the AIPSN comprises 40 organizations in 22 States committed to the use of science to promote equitable and sustainable development. Together, they reach an estimated 18,000 villages spread over 300 districts. The network has brought together students, school and college teachers, scientists, doctors, professional experts, writers, workers, farmers, political activists and thinkers on a single platform.

Since an important dimension of the PSM's work that has seen some positive development is in the area of gender we again need to note that a major push in this area came through the PSMs' involvement in the total literacy campaigns – where a large part of the mobilisation took place among women. This led to the formation of a platform (SAMATA) to specifically work on gender related concerns. Samtha Jatha (women's campaigns) for equality and education of women were organized to involve women and children in science activities. This gave the network an opportunity and wherewithal to publish a large number of books of science in national languages and prepare them for continuing education of neo-literates.

Towards an assessment of the PSMs' organizational challenge

For an assessment of the challenges facing the peoples' science movements (PSMs) in respect of the development of organization for the execution of incomplete tasks it is necessary to begin the discussion with the identification of challenges that motivated the founding member organizations to form in 1987 the All India Peoples' Science Network (AIPSN). At the time of its formation the peoples' science movements were in infancy in most states except for Kerala, West Bengal, Assam, Delhi, Madhya Pradesh, Maharasthra, Karnatka and Tamilnadu. The three main challenges confronting the democratic movement, for which the PSMs were to consciously develop their capabilities through the formation of AIPSN, were recognized as "popularization of science", "preventing the misuse and abuse of science and technology" and "organizing the people for alternate S&T policies and practice". Further, there was a recognition that even with regard to the implementation of the above said three challenges the breadth and depth of capabilities of most of the founding member organizations were not up to mark. The AIPSN was established to serve the members as a mechanism of collective learning, experience sharing and handholding. The notion of capability building included the fulfillment of the task of creation of progressive consciousness as well.

At the time of its formation the AIPSN recognized that the strength of members was limited to urban areas. The sections that the PSMs attracted had so far their reach only up to the college teachers, doctors, scientists and engineers working in selected S&T institutions. In Bhopal and Puducherry the AIPSN debated extensively the question of how the PSM could be expanded to generate a larger reach. As the sections from where the volunteers were being recruited had also to be expanded the opportunity of literacy was identified as a way to move forward at the all India level. There existed a debate on how much importance the programme of literacy was to receive and where all the energy of all-India organization should be put was an important organizational question. Underlying this debate on the scale and scope of the programme the concept of PSM as a mass movement was also implicitly under debate. Although the situation of prevalence of differing views among the founding members did not persist after a certain time, but the organizational challenge it left for the AIPSN in respect of the capabilities and repertoire of actions needs to still be attended to and developed.

While the success of literacy programme helped to resolve the important issue of how the movement should move in what manner where all in the country, the question of how the expansion was historically decided by taking up the programmes like Hamara Desh, Cosmic Voyage, Joy of Learning, Desh Ko Jano Desh Ko Badlo, Peoples' Health Movement, Resource Mapping and Land Literacy. These programmes were consciously developed by the leadership of the movement to recruit capable volunteers for the implementation of the challenges identified by the founding organizations. However, it cannot be denied that the challenge of development of collective capabilities and a larger number of more capable volunteers is still very much alive and needs a creative strategy on the part of the movement as a whole even today. In fact the challenge of

upgrading of competence of even those who have come into the leadership at different levels is now the biggest constraining factor challenging the movement.

In this context, proposals are under consideration for the organization of study circles, "open education through internet based distance learning", learning before doing, hands-on training, project based apprentice learning and systematic hand holding can play in the incubation of capabilities is yet to be explored. A collective assessment of the movement is that sporadic efforts through cadre camps have proved to be insufficient. Further, whether the movement has been able to creatively use the literacy linked follow up programmes such as continuing education, library movement based on Jan Vachan, etc for the development of PSM competencies is also an issue on which the AIPSN has been thinking of giving much attention.

Achievements and limitations of mobilization through Jatha

While the charter that the founding AIPSN member adopted at the time of the Bharat Jan Vigyan Jatha (BJVJ) explicitly recognized that all the three motivations would have to be followed up through a variety of forms and programmes, but the form of Jatha has become a major tool in which the member organizations feel comfortable and appear to yearn for all the time to pursue most of the issues. Undoubtedly its perfection is today mainly attributed to the PSM efforts in science popularization circles. The BJVJ was used by the founding member organizations to spread the message of these motivations to the weak states. It was an exercise in the communication of distinct PSM messages to the people and was to be followed up by "agenda setting" experimental programmes and institutional capacity building for the follow-up on all those messages.

During the BJVJ their clear and explicit articulation helped the founding members of AIPSN to excite the social activism emerging around science in the country as a whole at that point of time. It helped the founding members of PSMs to gather support for the formation of the member organizations in a number of new states like Himachal Pradesh, Haryana, Andhra Pradesh and Tripura. In the states like Uttar Pradesh, Bihar and Orissa the capabilities existing on the ground in respect of the articulation of these challenges were even in quantitative terms quite weak at the time of the implementation of the BJVJ. In these states the movement got spurred only with the literacy programme implementation. However, the limits of this tool are obvious. The overuse of Jathas is not going to serve the purpose of building of competencies for the identified challenges. Its limited capacity to attract competent individuals for the PSMs is creating a constraint for the movement from going forward rapidly.

Capability upgradation for real world experiments, development of social carriers for evolving programmes and institutions for STI

The process of building of real world experiments related science, technology and innovation (STI) capabilities for the purpose of taking up the agenda setting exercises for alternate development is still in need of a coherent strategy. It is going on unevenly within the latecomer states. Be it education, health or technology application this unevenness exists. The phase of institutional development is similarly in infancy in most of the cases. The State Resource Centers (SRCs) are trying to meet this challenge; but the AIPSN is yet to take note of their potential with regard to the building of PSM capabilities. In the literacy states where the expansion of PSMs started with the total literacy campaign the pace of this process is certainly somewhat better. While the process of capability building for the purpose of agenda setting for the challenges identified by the founding members has crossed the threshold of formation of a critical mass in these states the question remains of how the AIPSN should make use of the SRCs and the new experiments that they are taking up to benefit the movement as a whole. At present even with regard to the goal of "preventing

the misuse and abuse of S&T" the competence levels are far short of the expectations of the movement as a whole.

While to some extent the progress is visible in the case of the challenge of science communication because of the programmes like "joy of learning", "cosmic voyage", 'jantar mantar", "children science congress", "book publication for jan vachan" and "continuing education", but the AIPSN needs to do more in the area of science communication. The challenge is not just one of much more to be done for the sections that are being targeted through the above described programmes but also one of how the AIPSN would accelerate the pace and deepen the process of capability building for the new target groups even in respect of this challenge. The processes being used in the sphere of primary education by Eklavya, Navnirmiti, Jodogyan, Tamilnadu and Karnataka BGVS are assessed to be full of value for science communication to all those latecomer organizations that need to accelerate now their pace of capability building quickly.

Further, as the capability building for the implementation of other two major challenges is even weaker, we also need to galvanize the contribution of the emerging programmes of science learning and public communication of science in the areas like climate change, agriculture, food security, health for all, etc with the campaigns being taken up now on these issues within the network. There is much scope for the integration of the identified challenges in the programmes being taken up by the organization. Programmes of livelihood improvement and rural development through technology application in the areas of rural nonfarm systems and agriculture that the AIPSN is in the process of taking up can be suitably integrated with the SHGs and Kisan Manches that the BGVS has been able to form as a part of the convergence programme being now taken up in a big way. See Dinesh Abrol (2011, 2012) for the perusal of the challenge facing the PSMs in the context of the development of resources and institutions for the ongoing work on peoples' technology within the PSM.

In the case of all the major programmes the breadth and depth of capabilities that have been developed for the implementation of the challenges concerning "preventing the misuse and abuse of science and technology" and "organizing the people for alternate S&T policies and practice" are in need of suitable upgrading. The next generation is required to be developed; a task that the PSMs cannot ignore anymore. In most states the PSMs need to expand rapidly their reach among the new target groups. NGOs are competing and taking away the volunteers being attracted by the movement. In this new capability building phase PSMs should be integrating into the programmes those components that can also generate part income for the volunteers. If the times are different and the ground situation is also difficult from the standpoint of the survival of volunteers, then the strategy must try to integrate where needed and possible the task of capability and consciousness building with the income generating instruments. Of course, for the implementation of such a strategy the PSMs would need extensive help from the larger democratic movement.

While there exists everywhere several possibilities for the collaboration of PSMs with the larger democratic movement, there is an urgent need to explore some of the possibilities on priority. Interventions under development within the movement in the sphere of policy for higher education and its campaign for right to school education up to X class are highly relevant at the moment for the achievement of the PSM goals. Since the possibility for a wider mobilization of people through the PSM organizations exists at the level of even the agitations and protest campaigns being taken up by the democratic movement, from the side of the All India Peoples' Science Network the development of attention in this sphere is still not deep enough.

The challenge facing the movement in the sphere of policies for education is giving the PSMs scope for both, the development of countrywide agitation and the revitalization of curriculum

framework related non formal interventions. In all the states PSMs can also use this opportunity for the identification and mobilization of all those students and teachers who have an interest in the perusal of activities of PSM in the mainstream institutions. In fact, such an initiative from the PSMs can benefit the larger democratic movement in a big way. The Government is going completely neo-liberal in the sphere of education policy, and to meet this attack the resources of PSMs, student and teachers, youth and women movement need to be combined. The task is "Save Government schools", and "Save Indian Universities". Using the instrument that the PSMs have been honing in respect of curriculum framework and value content through their non-formal interventions the movements would be able to enter these institutions in a better way and mobilize new volunteers for the movement as a whole. This is also the way to revitalize these institutions.

PSM and gender dimension of mobilization

There exist some lessons for the PSM from the experience of formation of SAMATA. This is an initiative taken for the consolidation of gains of mobilization of women during the course of literacy movement. This is where the larger democratic movement is itself active. After much debate, the PSM created the SAMATA platform with a view to add something distinct and special to the agenda as well as the practice of the larger democratic women's movement. It is now recognized that the SAMATA platform did seminal work in the field of micro-finance even developing a self reliant model MALAR model for the development of self-help groups (SHGs). This programme expanded rapidly and the PSM has over 20000 SHGs today. In many areas this programme has also helped to develop women's leadership. However, in terms of its larger contribution, there is still much left to achieve. In the sphere of gender equality and S&T SAMATA has a lot to do. In this area though the SAMATA started "science in the kitchen" programme in its initial years, but it has not been developed further. A larger community kitchen initiative is needed with a view to mobilize the community for the nutrition of women and children.

PSMs through SAMATA have the potential to make a unique and seminal contribution to the larger women's movement. This has largely happened mainly because the platform of SAMATA has been seen by the leadership as just another initiative for the perusal of women's rights in its areas of influence. Being a platform that can make a unique contribution by focusing on non conventional challenges that arise out of the failure of S&T to become gender sensitive from within it is a task of the PSMs to develop such a programme through the platform of SAMATA. The capabilities of women activists of the movement should be raised in this direction through an AIPSN coordinated programme. The PSMs need to evaluate all science and technology programmes through the gender lens. Even the PSM's own initiatives must also be evaluated through this lens. At the last All India Peoples' Science Congress (AIPSC) it was proposed that the AIPSN should be holding a conference of Science for Women like the Peoples Technology Congress to be held once every two years to focus on the issue of gender equity in S&T.

In order to facilitate women's access and ownership of scientific knowledge and technology discussions in the AIPSN have been veering around to tackling the challenge of integrating the SHGs with the work being taken up in the sphere of technology application. Constructive initiatives should also be taken at the field level to speed up this work across the board. SAMATA can be taking a lead in the field of drawing the women activists into the practice of ecologically and socially just agriculture and the activities related to value addition for achieving the goals of nutrition and good health. AIPSN should help the SAMATA platform to reinvent itself through these initiatives at the earliest.

As far as the expansion of agenda setting in respect of the challenges motivating the member organizations is concerned, a new challenge in the form of Nav Jagaran aimed at the development

of democratic values and scientific attitude in the sphere of social life is also beginning to receive attention from some of the member organizations. Particularly in Haryana the concerned challenge has been pursued to the maximum extent. The PSM tools have been adapted and reshaped to carry the message of struggle within and outside on these fronts at the level of community life. In the context of the need for an expansion of the agenda of social reform in the Hindi belt and the growing rightwing assault on progressive social values in the country its contribution needs to be appraised by the network as a whole. There is much potential for integration of the initiatives of nav jagaran movement for the secularization and social justice with the initiatives to be taken up for the democratization of local institutions and of resource use in the country as a whole (use of drinking water, ponds, commons, schools, health, livelihoods and so on.

Three distinct conceptions of organizational development

There have coexisted at the level of the practice of social activism three distinct conceptions of "peoples' science". Within the PSM these conceptions have played a determining role in the shaping of programmes and organization. One of the conceptions is that the PSM activists should work as "socially conscious experts" .providing support to the larger movement as advisors and supporters. In this conception the main task is therefore defined as one of giving advice and providing organizational support to the larger democratic movement in the struggles involving S&T related policy aspects. As far as their direct contribution to the organization of PSM activity is concerned, this conception suggests that PSM activists should be devoting their energy mainly in the sphere of public communication of science.

The second important conception is that the PSM activists should try to take on the role of an interface between the organizations of mainstream S&T and development and the poor and marginalized people who are otherwise likely to be bypassed by the state apparatus. PSM activists should try to ensure that the marginalized people are not deprived of their share of access to mainstream effort going on in the sphere of science, technology and development. This conception holds that scientific temper can grow better through the interface activity of the PSM. By taking up actively the spread of mainstream education and public communication of science and the diffusion of appropriate technology to the marginalized people PSM activists can bring the marginalized people closer to the democratic movement.

The third conception suggests that the PSM activists should work as a counter-hegemonic force which means the people should also develop a critical understanding of S&T. While collaborating with the people, the role of PSM activists is larger and should not be limited to providing relief to the people. Peoples' consciousness and organization must be raised to the level of a counter hegemonic force through the PSM activities. PSMs should define their main organizational task to be one of how to bring about a progressive shift in the role of science in society. PSMs should struggle for a change in the way science and technology are being developed as knowledge systems and being implemented in the field by the mainstream institutions which includes both public and private sector.

While there is and will remain a common ground among these conceptions, there are also important differences. First of all, it seems that the notions of PSM role are associated with the differing conceptions of development. Second, the differences are also seemingly due to the differing conceptions that the concerned protagonists of these three organizational perspectives hold with regard to the role and contribution of science and technology in society. Third, if the protagonists of all these three views are expressing their position on what do they think about the limits of contribution of PSMs to the democratic movement, then the question is really one of only how the PSMs hope to resolve the connection between their tactics and the strategy.

Developmental progress does not proceed along a single line from backward to advanced; progress is a branching process with choices along the way. The conflict is about those choices. If the choices being made are ecologically and socially just, then the counter hegemonic process can be assumed to be very likely in place and functioning. Further, it seems that though these three conceptions do not differ in their understanding regarding the role of the existing state apparatus in the Indian society, but they have different views on how the State can be altered. Their conceptions of political practice are certainly quite different. Within the PSMs between these three conceptions of organizational development a dialogue needs to be initiated to deal with the issue of the impact of these conceptions on the practice of governance of S&T and on the development of PSMs. Since the PSMs have the potential to influence the larger democratic movement on these questions this agenda should therefore get appropriate importance in the coming days.

Taking a note of the emergent ideological challenge for PSMs

The Peoples Science Movement (PSM) has emerged by looking at science as an area of social activism. The PSM has emerged within a historically valid critique of capitalism that viewed science and technology as the means for maximizing profits through the development of productive forces. Because of the consideration for the practice of science leading to constant revolutionization of productive forces the aspect of uncritical support for the mainstream practice of science and technology has been seeking attention for quite some time from the PSMs. Contradictory experience of the development of productive forces under late capitalism from the standpoint of the Indian society did not get sufficient attention in the case of the adoption of technologies of "green, white and blue revolutions", health, drinking water, sanitation, town planning, buildings, transport, energy, habitat development, etc., from the PSMs. The impact of colonial and feudal ethos and relations and the backlog persisting in respect of human development (man / woman as productive force) has been that the ruling classes have followed in practice far more the pathways of technological dependence and slavish imitation. These pathways and the linked vested interests have become eventually now a fetter for the practice of self-reliant development of productive forces. Since it was not possible to reproduce the tendency of constant revolutionization of productive forces, a feature that Marx recognized to be occurring under capitalism in the core formations and which is also till very recently assumed to be occurring in United States and some parts of Europe, the PSM leaders have been of the view that in India the State and Society need to be consciously mobilized to foster the creation of state sector or public sector enterprises. PSMs did not emphasize enough on the social movements to take themselves the initiative to form the workers' cooperatives, group enterprises of workers and peasants and collectives of professionals to act as the social carriers of innovation. Experience indicates that it is possible for the social movements to stimulate and organize the participation of people through these social formations as a conscious agency of the systemic development of productive structures.

Today in the absence of the above mentioned conditions due to the changes in policy regime after the introduction of liberalization, privatization and globalization a vicious cycle of technological stagnation prevails and the productive structure is in the trap of producing technological fragmentation. Dualistic technological modernization is the outcome where the reproduction of conditions of persistent stagnation of the long tail of micro and small scale capital can be expected to become a constant feature. Therefore, the challenge before PSMs is clearly one of mobilizing the S&T personnel and people to engage with each other as quickly as possible for the articulation of such pathways of alternate development which will allow India to develop the socio-technical systems in a self-reliant manner and in an ecologically and socially just way.

Capitalism, neo-liberal order and the question of formulation of PSM alternatives

During the period of last twenty five years, since the formation of the AIPSN in 1988, as these developments have occurred in the conditions of late, semi-autonomous capitalism, capital has been able to embed quite a few important changes in the relationship of science and society. Consequently contradictions between the laws of capitalism and the development of science and technology are sharpening. First of all, the Indian society is experiencing the sharpening of a contradiction existing between man and nature that capitalism is unable to solve - the logic of capitalist growth is embedded in the paradigm of mindless increase in consumption by the few, which now places an unsustainable burden on the finite resources of our planet. It is a contradiction that threatens today the very existence of humankind on the planet. When the AIPSN was born, concerns about the impact on capitalist development on environment were considered as a marginal problem by the PSM leadership. Today it has become a much larger concern. Although during the period of last two decades activists of the PSM have gradually learnt to respond to the issues arising out of the concerns about environment, but the issues linked to unsustainable development and its consequent role in climate change are still in the process of being ideologically resolved within the movement.

The demands of global capital, mediated through the market, are increasingly driving the trajectory of advances in science. Today the behavior of global capital is acting as the principal barrier to the advance of science as a knowledge system capable of serving the needs of the people. Because the needs of a neo-liberal economic order valorize immediate gain as the principal driver of science and technology development consequently the efforts being undertaken are also misdirected in the public sector institutions. As the goals of cultivation of science and technology are at stake, the challenge before PSM is one of how to identify these problems at the earliest possible stage of development of technological and scientific research. This kind of capability is becoming essential for the emergence of scientific counter-publics to take place in a timely manner in India.

Further, there is also the question of institutional changes taking place at the level of the systems of intellectual property, financing of innovation, education and training, and technological regulation. Science as an open system is giving away to the logic of the capitalist enterprise, where it is driven by the demands of a private research system, increasingly embedded within the heart of the educational system. Thus, the need to create private monopolies, and not the production of knowledge, is the principal driver of scientific research. Consequently, for example, the output of research is shifting from the production of open publications that enrich and advance science, to patents, that are leading the institutions of science and technology to actively promote commodification of science. While the demands of the market act in a manner that science is driven by the constant need to generate incremental product and process innovations that can be put on the market as a commodity, the development of system innovations needed for eco-social transformation suffer due to the lack of demand from capital for such investments.

Alternatives in the governance of higher education

In the past, as even in the core countries of capitalism under the conditions of state monopoly capitalism, a significant part of the development of scientific knowledge resided within the structures of higher education. As these were relatively autonomous of both the state and the market, a part of the system of generation of new knowledge was not at least closely bound by the immediate needs of the capitalist class. The university system, thus, was able to retain a sense of independence and self-regulation for a part of the system of generation of new knowledge. Education was therefore still seen to have a larger purpose than merely serving capital or the needs of the state. As a result,

the educational system also provided a place for contestation – a place where new ideas arose not only in the respective disciplines but also about society itself.

Today, within the altered system of education, students are regarded as consumers and the university-education system is structured like a commercial enterprise. In such a system of knowledge production, a deeper analysis of nature that has no immediate commercial application is of much lower priority than what the industry considers as lucrative research. Thus long term knowledge production is devalued in favour of immediate and short term gain. Further, research priorities are shifting away from those that address the needs of society to those that service the needs of people who can pay. The system is increasingly being funded by corporations or by the state working at the behest of corporations. Thereby, science is no longer seen as a way to advance knowledge and the well-being of society but as a means for generating profits for large corporations. The PSMs have a responsibility to put forward its alternatives.

So far, in India, we have the experience of setting up elite public universities as only the self-organised bodies where academics were the sole decision makers. But their record as the sites for the development of science for nation indicates that their choice of problems and topics is far less linked to the needs of the Indian society. Science was under development as a knowledge commons in the United States of America while being linked to the problems being thrown by the technological, economic and social development needs. The principle of social control needs to be taken forward. The alternate governance framework is asking for innovation such that academic activity should also be accountable to the people by partnering suitably with relevant user groups. Needless to state, each and every educational programme would have to come up to the prescribed standards of integrated scholarship. Some of the trade unions, developmental NGOs, people science movements (PSMs) have teams that are better motivated to incubate innovative educational programmes. To get started they can be mobilised by social and political movements to take up experiments and implement innovations in HEIs around this alternate perspective. See Dinesh Abrol (2010 a, 2011 b) for the alternate proposals under discussion within the PSMs and the left movement in the context of governance of Indian higher education.

Alternate proposals for the development of institution of intellectual property rights

The last two decades have seen the creation of a new category of private property rights called Intellectual Property Rights. The objective of this exercise was twofold. First, it sought to give a cover of individual creativity to legitimize essentially corporate rights. The second was to expand enormously the scope of these rights. The impact of this new IPR regime, coupled with the global trading regime under WTO, has led to the private appropriation on a grand scale of commonly held biological and knowledge resources of society. The patents regime today has expanded to patenting of life forms, genetic resources, genetic information in life sciences, patenting methods and algorithms in computational sciences and even patenting of how business is done. Traditional knowledge and biological resources, held and nurtured by different communities, are being pirated by global corporations. Increasingly, the enterprise of science as a collaborative and open activity for creating knowledge is being subverted into a corporate exercise of creating monopolies and milking super profits from the consumers. See Dinesh Abrol (2004, 2006 and 2008) for the alternate proposals under discussion within the PSMs and the left movement in the context of development of intellectual property rights.

Challenge of the promotion and development of alternate social carriers of innovation

The twin challenges that PSMs face today as regards the production of knowledge and the use of this knowledge are: on one hand the destruction of the planet's ecology as a consequence of

rapacious use of its resources because of the way capitalism develops and uses science and technology; and the private appropriation of knowledge production and knowledge use. The environmental and ecological movements seek to safeguard the physical commons (grazing lands, forests, fisheries, oceans and atmosphere) for the good of humankind against their private appropriation. The movement for knowledge commons, on the other hand, is about liberating knowledge production and reproduction from the clutches of a few rich corporations and rich countries. Never before has society had the ability to bring together different communities and resources, like it has today, in order to produce new knowledge. What stands in the way of liberating this enormous power of the collective for production of new knowledge and designing new artifacts is the monopoly rights and private appropriation inherent in the global Intellectual Property Rights (IPR) system.

While this understanding tells us that science needs to return to its former open and collaborative method of working, but there is also the question that should the PSMs ask the Indian society to leave the task of management and development of the 'commons movement' to solely the academics or do we also need the people to participate actively in the processes of knowledge production. PSMs will have to share the challenge of development of a new set of social carriers to redevelop the system of knowledge production and innovation as not only a commons but also where the academics and people are co-producers and are following the practice of respecting the priorities and participation of people in knowledge production. Since the process of realization of the embedding of public values of ecological and social justice in the production of knowledge is not an automatic one and needs an appropriate agency as well as a structure, it is necessary for the PSMs and all the other social movements fighting for a left and democratic agenda to also take up the role of development of a set of new social carriers of production and innovation.

PSMs' engagement with faith, reason and science

The PSMs stand for directing the enterprise of science to undertake knowledge production for the development of a better understanding of nature and to generate theories and methods that provide the nation with the relevant tools of sustainable human intervention. The PSMs will have to strive for the development of productive forces in a systemic way. The PSMs need to ensure that the process of technology implementation remains geared to improve the living conditions of the people on the planet. The PSM's need to provide to the people on a regular basis the critiques of the ways in which under capitalism the enterprises of 'modern' science and technology have been developing and affecting the lives of people. The PSMs critiques are not a critique of science itself, but a critical understanding of science under capitalism, where its full potential is denied and often misused. In this understanding, the PSM differentiates itself from the understanding of many anti-science groups, who view science itself as a major source of exploitation, deprivation and violence against the people.

The PSM's view of science is not limited to the physical sciences but extends to all spheres of human activity – thus it includes not just how man interacts with nature but also to how humans interact with each other in society. The PSM also differentiates its understanding from that of the "rationalists" who view "irrational" behaviour as the root cause of why science is not able to achieve its full potential. The PSM, while recognizing that irrational behaviour (in the form of superstitions, irrational beliefs, etc.) does act as a barrier to the spread of science, locates such behaviour in broader societal issues and practices. Meera Nanda (2010) criticizes the PSMs for moving away from the practice of politics of countering old beliefs and spreading scientific temper. The ideologues of PSMs have been accused of ideological deviation of not wishing to directly target faith, ignoring threats for science coming from 'anti-science' group and becoming soft on the ideologues of post

modernism in India. The PSMs have been accused of collaborating with the post-modernist ideologues of 'Alternate Sciences, 'Hindu Science', 'Eastern' Science such as Vandana Shiva, Ashis Nandy, Shiv Vishawanathan and many other such figures.

As far as the theoretical and ideological stance on the origins of modern science is concerned, the PSMs favour the theory of multi-cultural origins and interactions taking place between different cultures and socio-economic formations for the development of emerging contributions in modern science. The PSMs have never bought the theories of Western or Eastern science and Hindu or Islamic or Christian Science. Considering that throughout the history of science the relationship between philosophy and science was an important link it is possible to trace the origins of scientific theories to the interactions existing between different cultures. Modern science is however a unique endeavour on account of the experiments and methods that scientists use today. The challenge of how to encourage inter-cultural interaction in health and medicine, agriculture and allied sectors of animal husbandry, forestry and fisheries, where the outreach and penetration of the modern sciences is limited, is in the process of only now being taken up and needs an open mind. However, the PSMs remain quite wary of all such attempts that wish to promote the agenda of reconciliation between faith and science to construct the way forward for the achievement of progress in science, reasoning and development.

The response of PSMs has been that modern technological development does not seem to pose much ideological problem for the practitioners of institutionalized religion. Whereas the ideological challenge from modern science to religion is enormous and growing due to the progress being made in scientific knowledge and methods. PSMs have been confronting the religion indirectly by taking up the challenge of secularization of knowledge, education, medicine, and many other such technological fields. There has been no dilution in the practice of dissemination of scientific knowledge available on the origins of universe and life, human evolution and many other such topics. The PSMs are active in the promotion of the changes required to be made in respect of science teaching and learning of the methods of science both within and outside the classroom. However, there is certainly the challenge facing the PSMs whose activists will have to be ideologically, scientifically and technologically equipped to undertake confrontation with the emerging challenges in respect of patriarchy, caste based discrimination and communalism.

It is clear that the PSMs will have to build their own repertoire of cultural actions to deal with the neo-traditional politics of identity formation on the basis of caste, religion, etc. The PSMs must pursue the convergence of educational, developmental and health actions to foster newly imagined communities capable of changing the material aspect. The PSMs need to take up the challenge of creation of socio-technical systems which will through their adoption and diffusion strengthen the politics of worker-peasant unity and encourage inter-community cooperation and eliminate the practice of discrimination based on gender, caste, ethnicity and religion. Today the PSMs have the challenge of promoting a system of governance capable of following on the research agenda being articulated by the scientific counter-publics and the practice of precaution where needed in the conduct of technological regulation. The PSM activities will have to be developed increasingly as resistance tools of resistance to be wielded in the struggles for economic, social and ecological justice. The challenge of development of peoples' capabilities includes the raising of radical consciousness.

Towards the struggle for a democratic STI agenda

Finally, the PSMs are required to take up the challenge of how do we bring back societal concerns into institutions of conduct of activities of science and technology. The PSMs will have to seek a

democratization of these institutions, so that larger social goals determine the priorities in science. The challenge of how the people at home and abroad can offer their attention to those diseases that affect the poor people more and bring upfront the concerns of the poorer countries, who have neither the money nor the scientific resources to address their problems. The challenge of how the Indian society would be prepared to do its best to bring equity back into the system of advancing scientific knowledge. This brings us to the larger issue of how society as a whole can exercise social control over the enterprise of science. Earlier the movements of scientists placed this within the context of the social responsibility of the scientist. Today, the need for organising the scientists to struggle for a more democratic scientific decision making needs to go hand-in hand with a strong movement which aims to bring not only science to the people but also promote the participation of people in the system of governance of S&T. The challenge of how knowledge and science are to be generated and used is too serious a business to be left to the scientists, corporations and political bureaucratic apparatus to handle between themselves. Today clearly the primary role of the PSMs is to rescue science and technology from the clutches of global capital and make it available for the good of humankind.

Science and technology have a double edged character under capitalism. PSMs are required to play their counter hegemonic role and should be working on the alternatives and alternate policies. Under capitalism debates about technology are often weapons for the corporations or the scientists behind them in the conflicts of interests. Under capitalism the ruling classes have an interest in turning science and technology into a activity subordinated completely to the goals of profit seeking and maintenance of power of vested interests. But as a conscious struggle is necessary for the truth to emerge or the public interest to prevail under capitalism PSMs must accord much emphasis to their counter hegemonic role. It is also clear that this struggle will have to be carried out by the proponents of progressive change in a conscious way. It cannot happen through merely a spontaneous process. The progress of science is not the smooth penetration of light into dark corners.

Science becomes a weapon against the people when the pursuit of private profit and irresponsible state power drive the activity for war, surveillance, exploitation, and destruction. Science should be governed by public values. Scientists have social responsibility. Science is a friend to the people when mobilized to serve their enlightened interests by the society. Science and society have entered in to a relation of mutual influence and the relationship for it beneficial advancement needs conscious and enlightened mobilization of the scientists as well as common people. Science can contribute to the elimination of poverty and inequality. Science can become a tool of liberation. Science can become a weapon against oppression and bigotry in the hands of people. Science can be liberated from the influence of reductionism, determinism and move sooner towards holism and universalism.

Today within AIPSN there is a consensus on the development of peoples' science as a mass movement. This conception needs to be geared towards the direction of building the PSM as a strategic coalition of all those who wish to use the tools of modern S&T in the interest of humanity. It is also obvious that the PSM activists should have a critical understanding of S&T. It is quite essential that the Peoples' science activity is developed as a counter hegemonic process In order to achieve a realignment in the role of modern S&T to make it people oriented there will have to be much emphasis in the AIPSN on the enrolment of a new generation of socially conscious persons who are not only better educated but also quite comfortable with science and on the job learning to keep alive the traditions and culture of the implementation of peoples' science activities in India. As the scientists need to treat the people as partners for the practice of socially responsible science the challenge of alternate institution building becomes an important task of PSMs. The state and

society can transform the practice of science when the people are conscious and made active partners to bring alignment between the goals of science and technology with the social priorities.

References

David J. Hess (2010), To Tell the Truth: On Scientific Counter-publics, Science and Technology Studies Department,, Rensselaer Polytechnic Institute, Troy, NY 12180-3590, Forthcoming in Public Understanding of Science, 2010. This is a pre-copyedited version that is close to the final version.

Abrol Dinesh (2012), "Pro-poor Innovation Making: Lessons from India", in Shyama Ramani, UNU MERIT edited book on National System of Innovation Cambridge University of Press*

Abrol Dinesh (2011), Peoples' Science Interventions and the Challenge of Rural Technological Transformation: Lessons from India in "Constructing Culture of Science - Communication of Science in India & China", NISCAIR

Irfan Habib (2008), "Maulana Abul Kalam Azad on Education and Culture in Post Independent India", Maulana Abul Kalam Azad and the National Education …, 2010 - nuepa.org

Raina Dhruv (2004), "Domesticating modern science: a social history of science and culture in colonial India, Tulika Publications- indianmedicine.eldoc.ub.rug.nl

S Chatterjee, E Chatterjee, "Satyendra Nath Bose', 1976 -arvindguptatoys.com

S Chatterjee, E Chatterjee (1984), Meghnad Saha, scientist with a vision, S Chatterjee, E Chatterjee - 1984 - getcited.org

Chatterjee, Enakshi (1990), Masterminds, Orient Blackswan, New Delhi.

Abrol Dinesh (2010), Governance of Indian Higher Education: An Alternate Proposal, Social Scientist, September-December 2010 New Delhi

Abrol Dinesh (2011), Alternate Framework of Governance of Indian Higher Education, SEMINAR, August 2011 New Delhi

D Abrol (2004), "Science and Technology: Current Imperatives", - Social Scientist, 2004 - JSTOR

D Abrol (2006), "Democratising Indian higher education", - Social Change, 2006 - sch.sagepub.com

D Abrol (2004), "Lessons from the design of innovation systems for rural industrial clusters in India", - Asian Journal of Technology Innovation, 2004 - Taylor & Francis

A Perspective for People's Science Movement in India

D.Raghunandanan

The historian of science, J.D.Bernal, wrote that the history of science is conventionally taught, and understood as, a narration of various discoveries in sequence of time, whereas it should really be studied and understood as the history of the relationship between science and society, how and why particular issues came to be examined, how the findings were used and why, and in general how society shaped science and vice-versa. Bernal also wrote that, in fact, this monumental task required a far deeper understanding of both science and society which even he was not prepared to attempt, preferring instead to give his famous four-volume book the title "Science in History" rather than a "history of science". Bernal was of course being modest, and technically correct, yet his book, which examined the progress of science in the light of evolving societal contexts, constituted a serious examination of the historical relationship between science and society. Like all good history, and all good science, the understanding put forward by Bernal needs to be taken as a good foundation on which to build and has therefore been revised, updated and dare I say improved.

In my presentation today, With this perspective, my lecture today seeks to present a historical overview of salient aspects of the relationship been science and society and, against this backdrop, looks at the potential role and function of the Peoples Science Movement in India.

Ancient period

It is somewhat of a mystery why the quest of human beings (*homo sapiens*) for knowledge, or what we today call "science", began from a curiosity about things farthest from human existence on earth, whereas the human quest for understanding and mastery over technique, or what we may today call "technology", began with trying to understand how things in the immediate environment worked and to make things which advanced the abilities of human beings (*homo faber*) and gave them an edge over other animals, ultimately enabling humanity to emerge as the dominant species on Earth.

Early humans learned how to make fire, cooked food, clothes, shelter and also how to make earthen pottery, melt metals and make tools and weapons, domesticate animals and cultivate crops, and create ever larger human settlements. In all these areas, knowledge was primarily empirical, that is, building up knowledge based on experience and experiments of trial and error, and then improving on what had been achieved. Early humans thus had no knowledge of the science of ceramics or metallurgy but had worked out how to fire earthenware and make hardened steel. Technique was to continue to advance through this method for many centuries with no theory to inform it, with the exception of architecture where at least, and certainly in Greek and related traditions, an increasingly sophisticated understanding of geometry contributed to complex buildings and structural concepts.

Yet much of early computation and mathematics grew from what was to be a predominant human quest for several millennia, apparently without any practical application, namely the effort to understand the movements of the moon, sun, planets and other heavenly bodies. Preparation of calendars and almanacs, and particularly the desire to work out astronomical cycles and predict occurrences prompted the push for more complicated and accurate calculations. These were mostly arithmetic in Greece and the Arabic speaking region, but benefited greatly by the invention of algebraic methods, trigonometry and advanced algorithms in India, notably by Aryabhata in the 5th century of the Christian era (CE). Computations were greatly assisted by the invention in India of the place value system and, of course, the zero. Euclidian geometry, Ptolemaic astronomy and Indian algebraic and computational systems were carried across regions, most often mediated by Arabic and Persian-speaking cultures, enriching each other and the common pool of mathematical tools and astronomical theory.

Early astronomy, however, did have one application, important in those times and significant for our understanding. Philosophers and other intellectuals who indulged in time-consuming observations and computational exercises required to be supported in some form. In early Greece and in the Middle East, this came from enlightened rulers, kings and nobles, who extended their patronage to scholars.

The sense of awe inspired by the vastness of the cosmos, the realization that the heavenly bodies followed some mysteriously systematic laws, all must have prompted a feeling that some super-natural being or forces were guiding them. The great Greek philosopher Aristotle drew up a full theory according to which the entire universe followed a divine cosmic theory in which the Earth was the centre (of course, since Man was a unique divine creation), surrounded by the heavenly bodies moving in divinely ordained orbits, which must be circular since the circle and the sphere were the most perfect geometric shapes and therefore divine. The Aristotelian theory was to rule the world for around 1500 years right till the dawn of modern science, well entrenched into the thought systems of all major civilizations.

In Indian astronomy, the vision of the solar system and the cosmos were not representative of physical reality but were mathematical models useful for calculations of the movements of the heavenly bodies. Nevertheless, so strong was the influence of the Aristotelian theories, that even the great Aryabhata felt obliged to work out the small circular sub-orbits or epicycles that the planets were supposed to make while going around the Earth, a theory devised by Ptolemy (a Greek-origin Roman living in Egypt) 200 years after Aristotle!

And if even the vast cosmos was governed by these supernatural forces, could ordinary human beings be immune? A belief in astrology, a notion that the sun, moon, planets and stars and their relative positions influenced events and the fortunes of humans on Earth began to gather strength. It may come as a surprise to Indians that astrology sprung up and took root in ancient Greece rather than in India where it now seems to play such a strong role in cultural life. But since casting horoscopes

and making astrological predictions required the services of those well-versed in astronomy - services that only kings, nobles and wealthy merchants could afford - patronage of astronomers by these elites became endemic, first in Greece and then, following their customs, elsewhere in Asia.

Indeed, royal patronage was the dominant form of support of these ancient scholars who also worked in the areas of medicine, alchemy (the effort to convert base metals into gold) and philosophy. Given this dependence on royal patronage, none of these intellectual efforts were applied to areas of concern to artisans and working people. Metallurgy, agriculture, machinery and masonry were all neglected in terms of theoretical development.

Medieval Era

The iron age heralded the end of the old grand civilizations, and of the large cities and empires so often based on slavery and plutocracies, the idea of a chosen class destined to rule. The era of settled agriculture saw a greater decentralization of power, the emergence of new elites based on the land. In the world of ideas, organized religion codified in a set of beliefs or in many cases in a Book became the dominant system of thought and of ideas governing social organization throughout the world. Christianity rose to dominance in the Middle East and then in Europe, while Islam rose not too long afterwards. In India, this period saw the consolidation of a new Sanatana Dharma Hinduism, overcoming Buddhist republicanism and the ritualistic rigidities of the older Vedic-Sanskritic religion. In China, the Confucian order had firmly established itself in the palaces and the countryside.

With all their mutual differences, one common thread of all these religions was the staunch defence and justification of the existing social order as well as the insistence on their own supremacy as an all-embracing system of ideas and beliefs. Political power vested with the landowning classes and feudal rulers whose rule was legitimized by the clergy or priestly class whom the former supported.

Christianity itself had risen and grown as a social protest movement mobilizing the masses against the oppression of the Roman conquerors, pagan priests and usurious moneylenders, and founding a faith in which all persons were supposedly equal. Yet within a few centuries, the new faith had constructed a hierarchical Church, which was soon adopted by the Roman Empire itself and therefore spread throughout Europe. The Church was not only more or less the official religion of the Roman Empire, and of various European nations after the collapse of the Empire, it was also among the biggest landlords, possessed private armies and ran the biggest institutions. The large seminaries or Church-run centres of learning were also the biggest educational institutions, had the most resources and the best libraries. Christian clerical scholars were the most numerous and well-supported scholars in Europe.

It is hardly surprising then that, even though Christian clerics produced a substantial body of empirical-scientific work, they worked strictly within the boundaries of an officially recognized set of beliefs, a dogma that could not be transcended, and therefore hardly produced any new theory or disproved any older one. The Aristotelian theory of the cosmos, along with Biblical teachings about the origin of the universe, humankind and other life on earth were not, indeed were not allowed to be, questioned for over a thousand years! This period is therefore called the Dark Ages by historians.

Other civilizations were not entirely dark, however, and plenty of new knowledge was being generated and creativity displayed in different regions of Asia, but at the same time with somewhat similar constraints.

In India, Aryabhata's work stands out for its originality and completely secular approach. His treatise on astronomy and mathematics *Aryabhatika* consists of just 121 *sutra*s in which he gives a full account of the place value system of numbers, orbits of all the planets, earth's rotation and

angle of inclination, the value of ð (pi) and algorithms for various computations including *sine* values for various angles. Except for the traditional invocational opening verse, Aryabhata never once refers to any scripture, always speaks of astronomy (*jyotisha* or the science of lighted objects) and never about astrology, and is not constrained by any Aristotelian physical model of the cosmos but instead constructs a representational or mathematical model which could be used to predict the movements of the heavenly bodies.

But within three hundred years, this independent and secular spirit of inquiry had been quashed by orthodoxy and a tendency to quote scriptures to justify or dispute arguments rather than to debate the issue in itself. In the latter half of the 8th century, the great mathematician and astronomer Bhaskara symbolizes this new era when he takes issue with Aryabhata partially on mathematical grounds but mainly accusing him of going against tradition and received knowledge.

By now, the feudal order had become well entrenched, an order which rested on land ownership rights given at the pleasure of the ruler, a rigid caste system with services being performed for the propertied classes by "lower" occupational castes, and the entire structure being legitimized as the "natural and divine order" or *varnashramadharma*, by the Brahminical class. Even though India did not have an organized Church as in medieval Christian Europe, its priestly class put their stamp of approval on this social structure that has often been described as a "diarchy" or rule by the warrior or kingly class supported by the priests. Such a hierarchical social order too could not allow challenges by independent, secular thinking which is a must for the free development of science in particular and knowledge in general.

Aryabhata's great work must have seemed a real threat to orthodoxy and the new traditionalist social order, since *Aryabhatika* in fact disappeared from India completely from India and was rediscovered only in the early 20th century when a version in Latin, itself having been translated from the Syrian-Arabic was found in Europe!

In West Asia, Islam rose in the early medieval period again as a protest movement (like most socio-religious movements of the time) proclaiming the unity of humankind before God and a community governed by moral codes. In contrast to the monolithic Roman Empire, there were now multiple centres of power in Damascus, Cairo, Istanbul as well as in Persia, Samarkand etc. Rulers extended patronage to many scholars who were not bound to any Church and who pursued diverse interests since Islam did not place any restrictions and did not have any dogmas on knowledge, so long as scholars stayed away from philosophy, morality or religion. One of the most invaluable contributions of these Arabic and Persian-speaking scholars was the translations they made, all under sponsorship of their enlightened rulers, of various works from all over the world, especially from China and India. Indian works on mathematics, especially algebra and trigonometry, and Chinese expertise in ceramics, paper-making and chemistry found their way into Latin mostly through Arabic texts. In fact most of modern science that was soon to be born in Europe was built upon this encyclopedic foundation of knowledge, compiled into definitive texts by Arabic and Persian scholars.

Being a common man's religion with declared democratic values, Islamic societies were more broadbased and less hierarchical than the pagan or Christian ones it replaced. Scholars also pursued subjects of interest to artisans and common people, and metallurgy, chemistry, ceramics, optics, astronomy, map-making, and a variety of machine-building made huge strides during this period. Manufacture and trade of commodities flourished, with common people benefiting substantially from this commerce. Thus while the princes and nobles were the dominant supporters of scholars, merchants too emerged as important sponsors and practical applications came to the forefront rather than merely contemplative knowledge.

Techniques advanced substantially and the beginnings of modern scientific theory sprouted but did not blossom. For instances, lenses were made and the idea that light bent when going from one medium to another was realized but not developed into a theory of refraction.

Yet scholars in this region, and during this period, were also rooted to a tradition of gathering information and building upon it, rather than questioning established theory and looking to go beyond it. Arab, Persian and Central Asian scholars compiled huge quantities of astronomical observations but never questioned Aristotle's or Ptolemy's theories.

Modern Science

It was in Europe of the 14th and 15th centuries that a set of circumstances arose that resulted in the birth of Modern Science. It is beyond the scope of this Lecture to go into details but, for the purposes of the main argument here, these centuries saw the almost simultaneous rise of widespread protest movements against the dominant Christian doctrines and the Catholic Church, the rise of industrial capitalism and the development of radical and rational new thinking, all of which came together in the emergence of modern science.

The institutional structure of science also underwent a major transformation. In the early period, the patronage of Kings and nobles was still essential, for instance for the voyages of Columbus, and the dogma of the Church still had to be fought as evidenced by the persecution of Galileo and the execution of Bruno. But soon all this changed in fundamental ways.

Universities had emerged in Europe as new and mostly secular centres of learning, attracting scholars from far and wide, still patronized by Kings and local merchants but independent for the most part. Scholarship itself had begun to have value as practical spin-offs and applications could readily be seen and appreciated.

Trade was now growing fast, especially through long oceanic voyages, and the needs of navigation led to the growth of professional services of astronomers, map-makers, those who could measure and plot courses for ships, with the merchants themselves becoming the paymasters. Manufacture of weapons and metal artifacts, clothes and other commodities also expanded with enlarging markets and new raw materials such as cotton. The new industrial revolution required new larger and faster machines, and the old water-driven ones did not suffice. Increasing demand for steel for weapons and ship-building pushed demand for coal. And it was to rapidly remove water from deep mines that the steam engine was invented by a combination of scholarship (discovering the principle of latent heat and the value of this concept) and artisanal craftsmanship. The steam engine led to many other inventions in spinning and weaving, different machinery, the railway engine and so on.

Those who paid for, and benefited from these inventions were no longer kings and nobles but industrialists, and the discoveries and inventions did not take place within Churches but in universities and factories. The steam engine was the first true science-driven invention and it can truly be said that modern science-based technology, as against technique based on empirical knowledge came to be born. There was no looking back. Both science and scientists (including engineers) had come into their own, increasingly driven by the new social order of industrial capitalism.

The discovery of electricity and electro-magnetism, and the invention of the electric bulb, of electric generators and motors, the telegraph and wireless rapidly transformed both science and society.

By the late 19th and early 20th centuries, a second scientific revolution had taken place with huge advances made by both science and technology. Corporations had begun to sponsor research at universities and had even started setting up their own scientific laboratories.

Knowledge, and science and technology as it was later to be known, had always been used for warfare, from the earliest catapult to steel swords to gunpowder and firearms. World War II saw this trend reaching new heights with a huge boost being given by rival governments to S&T due to their deployment in warfare in a race to beat the enemy. Radar, ultrasound, the jet engine, rockets and the computer were all products of WWII. Its aftermath saw the invention of atomic weapons capable of destroying all of humankind.

Today, in the 21st century, science and technology have grown by leaps and bounds, reinventing themselves every few years. It is now impossible to say where science ends and technology takes off, since it is no longer possible to pursue "pure" science with just a pen and paper or by simple experiments, science needs highly sophisticated equipment for which advanced technologies are required.

The benefits of science and technology have today spread to the widest sections of the population in terms of lifestyle, but so have the perils, with humankind facing global climate change threatening everybody but posing the greatest threats to the poor. Modern gadgets and other products are available to everybody but the profits are shared by a very few.

But most importantly, more science and technology research today is performed by private corporations, or at universities working on their behalf, than in public institutions. The inventors of penicillin or the X-ray did not think of profiting from their research, but today little or no research is undertaken without Patents. What used to be public knowledge, a common heritage of humankind, is now private knowledge of faceless and unaccountable corporations working to maximize their own profits rather than the public good. And the more specialized science has become, the less transparent have decisions become. Who decides what research will be pursued? Who decides which genetically modified crops will be introduced where? Who decides which medicine for which disease will be developed and how much it will cost? People are dying in millions from AIDS because the drug companies will not sell anti-AIDS medicines at low prices and will not allow anybody else to make them. Governments are supposed to monitor and regulate all these aspects, but with governments themselves becoming part of multi-national corporate processes, who will perform this task?

Peoples Science Movement

This is the function that history has assigned to the PSM. Science and technology have always been driven by social forces and controlled by specific institutional structures as we have seen in this Paper. Today corporate houses ride roughshod over peoples interests, and governments are increasingly becoming servants not of the public who votes them into office and in whose name they govern, but of corporate houses whose interests they serve.

The PSM must harness all knowledge about developments in science and technology, and how they will impact on society. The PSM must go to the people and spread this knowledge, taking S&T out of secret laboratories and ivory-tower institutions back amongst the people, so that people can take informed decisions on S&T issues that have such major impact on their lives but which is usually out of reach or control. The PSM must interact with working scientists and technologists, and put pressure on S&T Institutions, governments and corporate houses to reorient their S&T policies for the benefit of common people. Without such a role, without the PSM performing this function, science and technology can fall totally under the sway of the rich and powerful, and become a force to oppress the people. Science is the common heritage of humankind and, in today's world, only the PSM working side by side with all those forces engaged in struggles to democratize society in all its dimensions, can see to it that it indeed remains so.

Historical role: science for people; public policy; informed decision-making; democratization of S&T policy;

But cannot be done without knowledge of S&T; among the people; and crucially among the PSM; importance of technology communication

Both the above require linkage between PSM and Scientists in S&T Institutions

Struggle within scientific institutions; Bernal's original idea;

Alternatives; technology; open source; knowledge commons;

Democratization of science;

International solidarity; need clearly shown by climate debate

Science popularization occupies a unique place in the Indian firmament both within governmental institutional frameworks and in civil society. This has much to do with societal roles and responsibilities as perceived by diverse actors within this wide spectrum, especially against the background of the national movement for Independence and in the context of the oft-cited Fundamental Duty enshrined in Article 51A(h) of the Constitution "to develop the scientific temper, humanism and the spirit of inquiry and reform." Over the years, there has been considerable debate on what constitutes scientific temper and on whether the notion itself has connotations other than what meets the eye.

The present brief essay does not propose to address this debate, seeking instead to examine societal requirements for what is broadly termed "science popularization," a term although current that does not truly capture the burden placed by the Constitutional injunction. This perspective may also help avoid the usually dominant perspective of those engaged in science popularization at the transmission end, so as to better understand public needs and restore to common citizens their rightful place as key actors in a complex communication process that is, or should be, both multi-directional and multi-dimensional.

Science and the Public

Science has always been a specialized branch of knowledge although from ancient times well into the nineteenth century a scholar may have worked over a wide range of areas covered under different disciplines today. As an extension of broader philosophical pursuits, even a somewhat educated lay person could connect with scientific discoveries. However, with greater specialization in ever narrower areas within disciplines, the distance between science and the public has widened enormously.

Some other important factors too have contributed to this sense of alienation, and need to be noted briefly here although discussed subsequently. In earlier times, those who pursued scientific knowledge depended on the patronage of sections of elite lay society such as royalty, nobles, merchants and rich philanthropists who sought association with the advancement of human knowledge or benefit from its application such as in navigation, weaponry and so on. With funding of science having moved in the twentieth century to faceless bureaucracies or corporates, scientists have felt less of a need to communicate with a wider public and seek their support. The public confronts technology more directly than science and often understands the latter as mediated by the former. But with technology and its relationship with science becoming more complex, and new technologies themselves posing a variety of problems, the public understanding of science too is being transformed. There is also growing public ambivalence regarding science and technology due to the large gap opening up between the promise of S&T and the delivery of their fruits through public policy.

Reducing the growing mystification of science in the public mind is a major need. Part of this, but only a part, is to convey more S&T knowledge to those who otherwise would not be able to

access it, chiefly those outside the formal educational system. Information or factoids are undoubtedly important to feed a genuine thirst for knowledge among the lay public, ward off incorrect information or combat superstitions. However, this alone will not demystify science. The best science museums are those with not just photographs or static models but with exhibits that can be touched, played with so that science is literally brought within reach and its principles better understood.

Science popularization programmes undertaken in India during total solar eclipses have been successful precisely because they have been interactive and multi-dimensional, covering not just the phenomenon of eclipses and how they happened, but also addressing the solar system and the wider cosmos, how science came to understand them, and a lot more. People of course saw the eclipse themselves through special filters, were guided through the event. Perhaps most importantly, fear of eclipses was overcome without tackling the superstitions head-on with its attendant danger of making people who believed in them feel stupid or threatened, and therefore defensive. The sea-change in public attitudes to solar eclipses has been truly remarkable: from the first concerted awareness campaigns during the mid-1980s when streets of Delhi were deserted during the mid-afternoon eclipse and popular movies were screened on television to ensure people stayed indoors, to the considerable public participation in eclipse-gazing during the total eclipse in 1995 when Doordarshan telecast the eclipse live to a nationwide audience with commentary by eminent scientists and science communicators, through to 2009 when many organizations and supporting agencies conducted massive programmes throughout the country.

In Patna where this author was part of a solar festival, there were more people at the Maidan to watch the eclipse than were at the Ganga for a purificatory dip! The Solar Festival also included illustrated lecture-demonstrations interactively taking audiences through a journey bringing out the methods and goals of science through the history of astronomy in India and elsewhere, the story of the gradual acceptance of the helio-centric model of our solar system, the processes through which the models of Aryabhatta, Copernicus, Kepler and Newton were arrived at, the discovery of the outer planets and so on, and also lively discussions on astrology, superstitions, and contemporary problems such as climate change. Re-thinking a solar eclipse, how it occurs, how it is seen purely as a celestial phenomenon of rare beauty is one thing. But to also experience it as a window to a wider world of science, a process of observation, theory formation, questioning and further investigation, is quite another.

The loss of certitude

The public has many questions, but rarely gets a chance to ask them and even more rarely gets good answers. In the modern era, and owing much to the European positivist tradition, science came to acquire the reputation and image of having final, definitive answers to all questions: to be "scientific" meant being imbued with certitude. This is one of the abiding myths of science, often perpetuated by scientists themselves since it contributes to its popularity and the sense of awe it inspires. However, in science itself extant hypotheses and postulates have been the best possible answers at a given time, but also stepping stones to further investigation and new hypotheses. Science never ceases, never postulates the ultimate Truth (which can only be a religious or spiritual goal) and each discovery also provokes fresh questions. Science popularization too therefore cannot be simply the transmission of fixed sets of information: to be true to the avocation of science, it must help cultivate a spirit of inquiry, raising informed questions and embarking on a quest for fresh answers.

This is all the more important at the present juncture. In society, and even within science itself, the earlier mood or feeling of certitude has withdrawn. Within science, the probabilistic nature of scientific laws as in quantum theory, which prompted Einstein's famous remark that God did not play dice, opened the doors of non-certitude. Developments resulting from scientific discoveries,

such as nuclear weapons, also prompted a new type of self-examination and ethical questioning among scientists about directions of and choices in research. Many questions also came to be raised by new applications and technologies such as in genetic manipulation, cloning, nanotechnology where sections even within the scientific community argued that not enough was known about the future impact of such technologies, that therefore further research should be suspended till these were better known on the basis of what has come to be known as the "precautionary principle". In the wider public, such fears were magnified. Nuclear weapons and the threat of annihilation that has hung over the world for several decades, has brought home the idea that the fruits of science need not always be benevolent.

In earlier times, and especially in the immediately post-war boom, development was almost invariably seen in a positive light. The boons of science and technology such as electricity, household appliances, the TV and telephone, automobiles and air travel, all had made life better, at least for those who could access and afford them, and were aspirational goals for those who could not. Sure, there were murmurs of discontent, fears of being overtaken by technology, robots and computers going out of control and taking over the world.

New fears and criticism

But there were real fears and apprehensions too in the public mind, arising from the very unequal appropriation of benefits from development paths utilizing these technologies. Fossil fuel especially petroleum based power, transportation and industrial energy also brought in their wake huge pollution and finally global warming threatening all of humanity. The downside of the so-called green revolution started becoming apparent with loss of biodiversity, declining soil fertility and build-up of pesticide residues in the food chain. Large dams were causing displacement. Mining was not only displacing peoples but also severely damaging the environment especially in ecologically sensitive areas. The massive disease impact, loss of human life and long-term effects of industrial-technological disasters such as the deformed babies caused by Thalidomide in the US and Britain, the mercury poisoning of river waters in Minamata in Japan, the Bhopal Gas Tragedy here in India, Chernobyl all combined to create a picture of technology not only not benefiting humankind, but also running amok and standing as a clear and present danger to humankind. On top of existing fears about safety and hazards of nuclear waste, other frontier technologies such as GM foods and nanotechnology were seen as posing unpredictable dangers.

Several critics in civil society and public intellectuals, increasingly vocal and influential in shaping public opinion, advanced the notion that the danger came from modern science and technology itself, seen as intrinsically socially divisive, ecologically damaging and inspired by western elitist, anti-nature philosophy. Earlier debates had revolved around notions of the misuse or abuse of science, the bad handling of technology, but the challenge was now more fundamental and science popularization in the conventional sense was ill-equipped to handle it. To add to the problem, even the very notion of scientific temper was seen by some critics as being part of the problem, part of the same techno-centric model.

Clearly a different perspective on science and technology was required; one that saw and could explain the fundamentally societal processes that threw up specific technological choices and institutional structures governing the practice of science. Such a perspective has indeed been forthcoming from the Peoples Science Movement which had even drawn up a Charter elaborating this perspective. Recently, a World Forum of Science & Democracy comprising like-minded groups and movements including those of working scientists from Europe and North America has been formed. This article is not the place to discuss the Peoples Science Movement in detail. But the point to be noted here is that, in order to truly meet public needs, science popularization necessarily

has to deal with such and other contentious issues, in which debates will cross disciplinary boundaries, will not remain strictly confined within the domain of scientific disciplines and must deal with social and ethical issues and issues of political economy.

It may be understandable that established decision-making hierarchies in India are not comfortable with such pluralism, although they seem to be getting more so going by recent consultations with civil society in a number of public policy areas. But, as Government gets more accustomed to wider consultative decision-making processes necessarily involving pluralities of opinion, agencies with mandates to promote a scientific temper may also in the not too distant future not shy away from promoting discursive communication programmes so as to capture such plurality and promote a questioning attitude. A scientific temper, as against merely acquiring more scientific knowledge, requires in Amartya Sen's words both "internal pluralism", that is debates between contrary views on the same issue, and "external receptivity", i.e. an openness to ideas from other people or from elsewhere.

Technology - the missing link?

J.D.Bernal notes with interest in his seminal four-volume Science in History that science appears to have proceeded historically from the study of phenomena farthest from humanity, i.e. astronomy, to the nearest i.e. biology involving study of living beings including humans, whereas in contrast technological development moved from tools and devices of immediate use for hunting, homestead and agriculture to the most distant aircraft and space technology

Whereas it was never true that science preceded technology, or that new technologies only emerged after and based on some scientific discoveries, the industrial revolution certainly saw several technological breakthroughs such as the internal combustion engine follow from new scientific knowledge, in this case the notion of latent heat, or the various technologies arising from the discovery of laws of electro-magnetism. Even as late as World War II, governments regularly turned to applied scientists - "boffins" as they were termed in Britain - to come up with counters and improvements throwing up several new applications such as radar, sonar and the computer. But in the past century and more, it is becoming increasingly separate scientific discoveries from technological innovations since the former are themselves are more and more dependent on innovations in complex machines, laboratory equipment and techniques. Yet all technologies, and more so in modern times, embody science and serve as a window through which to perceive and understand science.

People though confront technology in their daily lives in a way they do not confront science. As the above examples of policy and development issues illustrate, science is "seen" by the public mostly as mediated by technology. And yet, when "science popularization" is undertaken in India, it is rarely about technology. If technology impacts on our lives more directly and immediately, how is it that science popularization seems not to give technology much priority?

Is it because as a society with an in-built hierarchical social structure and ideational constructs, India values the conceptual and intellectual more than it does the manual and artisanal? In India, artisanal and labouring castes are not only ranked the lowest, which may also be said of several other cultures, but are also lowest on the economic scale and have low social status. The higher wages received by skilled workers in Europe or the US may be ascribed at least in part to a shortages in the workforce, but the dignity of labour cannot be explained only by supply and demand. The same is true for the prevalence in the West of a DIY (Do-it-yourself) culture and the proliferation of DIY stores, the widespread familiarity with and possession of tools and small machines by middle-class men and women, the extent to which the middle-classes do so much of their own household repairs, carpentry, painting and so on. Television channels in the US and Europe have

numerous popular DIY programmes and programmes that explain how various things work and are made, which explain and discuss in detail home repairs, furniture-making and so on. With a very few valiant exceptions, we have little of this in India.

Technology itself is poorly understood, let alone grappled with. Rough and ready "jugaad" solutions are the order of the day, and skills at all levels are lagging behind the needs of the times. Of course this problem will have to be tackled through better education and training for which infrastructure, capabilities and institutional mechanisms. But even the present lack of these is indicative of some basic problems in perception and understanding embedded deep in our culture.

Science popularization needs to bring the technology dimension into its ambit. This could be truly transformational in terms of both the audience addressed and hence brought into the discourse, and as regards the scope and content of communication. Most of all, it would be about changing entrenched attitudes on the part of all actors. After all, scientific temper is itself an approach, a mind-set. It has to be imbibed and cultivated by all.

The Constitution of India upholds "cultivation of scientific temper" as one of the duties of citizens and exhorts the state to create conditions that encourage critical thinking.

Scientific temper is an intrinsic quality. It has to be imbibed and not merely imparted.

Article 51A (h): to develop the scientific temper, humanism and the spirit of inquiry and reform;

Amartya Sen in Argumentative Indian. Two eloquent phrases characterise a group that practices scientific temper - internal pluralism and external receptivity.

People's Science Movement in India

K.N.Ganesh

1. Ever since the formation of Organised People's Science Movement in India during 1987, the implications of the term People' s Science has undergone major changes, People's science had already challenged the standard concept of science as an elite occupation whose knowledge and research has to be shared by a few academics and experts, emphasised the concept of science as social activism, aimed at transforming the lives of the poor and exploited sections of the population. PSM also differentiated itself from those sections who were interested in discrediting the role of science itself in social development and formed groups and organisations marked by anti-science and subjectivist tendencies. The activities of PSM were characterised its involvement in a large number of social issues and problems directly related to the life of the poor, such as literacy, public health, drinking water, sanitation, fight against evils such as alcoholism, fight against religious obscurantism, education, IPR, environmental issues and involved itself in the local self-Government, self-help groups and women. Probably no other organisation has had such wide variety of activities as the PSM. As a result, PSM was able to gain solid people's support in states of Kerala, Tamil Nadu, West Bengal, Bihar and Himachal Pradesh either directly or through the organisation of BGVS.

2. Since then, the concept of science has also changed at the popular level. Although significant advances in science research are being announced regularly, science has become increasingly associated with technologies such as the IT, electronics, biotechnology and space and satellite technology, and with the number of gadgetry that are appearing regularly in the market. This association of science with technology as a commercial product has resulted in undermining the role of science as knowledge that has continuously augmented the productive forces and helped transform production relations. Instead science has acquired a mystifying influence through the gadgetry appearing in the market, which are considered essential components of neo-liberal 'market' society, and hence it is stipulated that everyone should acquire the technology. Hence there is insistence on the so-called digital literacy and talk of the 'digital divide', and those who are on the wrong side of the digital divide are considered

to be hopelessly incompetent to live in contemporary society. Similar 'divides' appear in the fields of public health, education, bio-technology and will appear in almost every field once the patents regime gets consolidated and every product of scientific research also is rendered a marketable commodity.

3. The growth of market-oriented scientific research sponsored by corporate capital and their research funding agencies that have liberally started flowing to the Universities also would mean that a certain kind of science activism would be sponsored by the corporate agencies themselves. This is already seen in the fields of drug industry, Biotechnology, promotion of GM foods and control of diseases such as AIDS. While the corporate agencies are bent upon marketing their products with uncertain consequences, NGOs also funded by the corporate capital are 'conscientising' the people against the evil effects of such products. Thus the NGOs function as a feedback system for the corporate capital to ward off any adverse consequence of their continuous marketing experiments. Nevertheless, corporate agencies succeed in influencing Governments and bureaucracies to such an extent that the real evil consequences of corporate 'science and technology' remain unpunished. This we saw in the case of the Court verdict on Bhopal massacre. The Endosulfan controversy is another case in point.

4. The implications of the corporate control over science always do not appear in such direct, drastic forms. They appear in a number of indirect and at times unrelated ways such as environmental issues, issues of pollution and sanitation, problems of availability of drinking water, clean air, and fertile, cultivable soil, availability of resources for production and daily life of the people, issues of housing and settlement, problems of urban conglomeration and so on. These implications not only raise the question of production relations, of the contradiction between capital and labour, of the contradiction between the state and the people, but also bring the man-nature relations into focus. The spread of corporate capital, its exploitation of resources, its forms of circulation and consumption practices (the domain of the 'market') result in problems like resource depletion with associated issues like deforestation and desertification; problems of organic and technological waste including nuclear waste and their recycling; transformation of the topography of the earth through urbanisation, mono-cultural corporate farming; development of ' infrastructure' and displacement and rehabilitation of population; impoverishment and destitution of poor farmers and their migrations and suicides and health hazards and new diseases that affect the morbidity rates of the people. Implications of these processes on the terrestrial climate, such as global warming or the depletion of floral and faunal wealth have already been noted. These issues are universalised and brought to remote corners through the functioning of corporate capital as global system, a process that is facilitated by new technologies such as the IT and space technology. In this process, the entire labouring population is formally subsumed under capital and as labourers and as reserve army they are bound the bear all its consequences, good and evil.

5. Some of these implications of the advance of corporate capitalism were perceived by the intellectuals and managers of the corporate capital themselves, such as the Club of Rome. Various reasons for the problem were advanced, such as the exponential growth in advanced countries, neo-Malthusian demographic explanations or simply the 'greed' of the people. Numerous Utopian solutions were also put forward, such as 'small is beautiful' (and 'strong' as stated by some interpreters), 'ecological communities' and a return to nature, which gave rise to the green movements that have wielded some influence in the Western countries, already ravaged by the problems indicated above. Despite their popular and emotional appeal, these alternatives failed to gain overall acceptance among the people, primarily because they failed to develop a concrete alternative to capitalism (other than socialism), despite their repeated exposures of the functioning of capital. The impact

of their activities was clear when the advanced capitalist countries mounted their agenda for world domination in the conferences from Seattle to Doha, and also in recent Copenhagen conference on Global warming, when massive protests were organised against the Global corporate policies. These protests also demonstrated the increasing realisation that the solution does not lay in any utopian thesis of small communities, but by mounting agitations against the Imperialist policies and exploring the socialist alternative in a serious manner. This was also reflected in the World Social Forum, where the radical groups, in spite of their numerous differences among themselves and also with the Communist Parties, were prepared to endorse a socialist position.

6. In India, however, the story of similar movements has taken a different direction. The struggle for environment has been taken up by movements of Gandhian or romantic socialist persuasion, now joined by various community organisations. Such groups, who prefer to be called civil society organisations have been working among the tribals, dalits, fishermen and various other dispossessed sections of population. They have either functioned as social service organisations that have attempted to bring the benefits of various schemes to the people and conduct struggles against corruption or anti-people practices by various Governments or have functioned as community organisations serving a specific community and their material and imagined legacy. Majority of these organisations have not endorsed a socialist alternative, and they have increasingly been in favour some form of utopian communities, or the real communities of religion, caste, ethnicity and gender. Some of these groups have been experimenting with alternative technologies, and in general have taken positions against what they have been calling as 'Western Science'. Their increasing alignment with the Community, utopianism of various kinds and their reliance on opportunist politicians who pay lip service to environmentalism has also persuaded them to come out strongly against the socialism and Communist Movements. They have also not taken consistent positions against Imperialism and corporate control over science. Many of them, particularly community groups, receive corporate funding of various kinds. This is complimented by the efforts by the state to use many such groups as carriers for their social schemes. This means that no broad based unity against Imperialism, neo-liberalism and corporate control over science is possible in the Indian context at the present, as no common grounds for mounting such a unity is visible.

7. The PSM in India, and in particular the All India People's Science Network has been treading a lonely furrow in this medley of voices and positions, attempting to combine science with democratic movements, incorporating the vision of grassroots democracy and socialism in the process. It has taken the position that fighting scientific elitism and corporatism is possible only by taking science to the people, using it as an enabling device to solve the problems of the masses, an effort which was specifically seen in the literacy and post-literacy programmes and campaigns such as the kalajathas. In this process, it has specifically rejected the anti-science positions taken by several other groups. These efforts have won the appreciation of the people in general and enabled PSM to gain roots in several states where the democratic movement is comparatively weak. It has mounted campaigns several people's issues, and contributed heavily in the conduct of decentralised planning and implementation in Kerala and other states. It has also successfully experimented with self-help groups, and associated with poverty alleviation programmes. However, it has refused to take the road of the NGOs and the so-called 'New Social Movements' of assuming a hostile attitude towards the Left and other democratic political parties, although it has adopted a critical stance on some of the issues. It has always taken the position that it is the duty of the PSM to bring science, scientific positions and the output of scientific research to the assistance of democratic struggles, and it has done this consistently.

8. In the present international and national context, there is a need for the PSM to go beyond the perspective in which it has worked so far. The issues that have been the major planks of the PSM activity, such as environment, health, education, decentralisation, and the impact of anti-people science and technology policies have become the concern of the mainstream political movements and struggles. New issues like land, water, food security, BT varieties of crops, patenting issues, GM foods etc have also appeared and are at present taken up by Political Parties as well as several groups. There have been attempts to take up alternative schemes by Local governments and some sections of the population. However, such efforts have been constrained by the fact that the existing scientific knowledge and perspectives have not been made available to the people, and as a result they are more inspired by emotion packed slogans, propaganda and communitarian sentiments rather than critical awareness of the changes taking place in their own society. The emphasis on community, identity, and attachment to one's own legacy invoked by these groups and movements has replaced the critical awareness of the plight of their people as a result of the machinations of neo-liberal capitalism. Such emotional appeals have also destroyed a critical awareness of the history of the people, replacing the scientific awareness of the settlement and spread of populations by the false communitarian notions of original legacy. Such sentiments, along with anti-science notions have already been spread among sections of the downtrodden, including the Adivasis and Dalits by various civil society groups and community organisations, and have been used to fan the fire by groups such as the Maoists.

9. The PSM has its task cut out in this context. It has not only to fight the anti-people science and technology policies of the neoliberal state, but also to fight the anti-science populism of the community and 'civil society' groups. However, this is not to discredit the positive initiatives taken by some of the Governments functioning within the neo-liberal framework, or to dismiss the positive contribution by some activist groups. This is only to underscore the displacement, destitution, and immiserisation of the broad masses of population as a result of the neo-liberal policies in the past decades, and the spread of sectarian emotional appeal of identity politics as a panacea for their misery. It should also be noted that such politics has penetrated the academic institutions and Universities where the scientists and social scientists are working, and are used by the elite as the ideological weapon of neo-liberalism to squash democratic movements. Hence, this fight is significant not only to save science from sectarian identity politics, but also to restore its position as the harbinger of social change, the liberation of the masses from the clutches of exploitation and misery.

10. This is possible only when the PSM addresses the multiple functions and possibilities of science:

a) As a body of knowledge science is to be demonstrated as methodologically superior to any other body of knowledge (such as experiential knowledge, intuitive knowledge, mysticism, belief systems etc.);

b) The role of science as of practical significance in the everyday life of the people;

c) Innovations in knowledge, in the forms of technology and epistemology are of direct significance to the production of the material life of the people;

d) Historicity of science, or the role of science in social transformations;

e) Double-edged character of science, that science in the hands of the ruling elites such as the corporate capital and the state can turn into a weapon of destruction, exploitation and immiserisation;

f) The necessity of critical awareness of application of science and social processes, that becomes the major resource for people's movements in their struggle for a better world.

11. Science, as physical and natural sciences, addresses the dynamics of the Universe, life and man-nature relations. As social science it addresses questions of man in nature and man to man relationships. Both these are important to understand the contemporary scientific and social issues, which can only be addressed through interdisciplinary mode of critical enquiry. Such interdisciplinary modes appear in the problems of environment, energy and other forms of infrastructure, public health, land and other natural resources, food security, technologies and their social applications, reproduction and gender and so on. However, even within the PSM, there is a conflict between technical and social solutions. Sometimes, solutions are fund in terms of pure science (or economics), without taking into account the social implications, and sometimes, the converse position is resorted to. Adoption of any of these solutions would imply that the PSM surrenders either to mechanistic materialism or to subjective voluntarism. Both these positions has had serious negative consequences in terms of the advancement of productive forces, and ushering in social transformation. The adoption of interdisciplinary modes of viewing issues in totality, without losing the scientific rigour, appears to be important in all the issues that are emerging at present. This means discovering the politics of science, as critical and innovative enquiry and practice. Politics of science involves positing society in the given scientific context and positing science in the given social context. Thus the time-honoured dictum of concrete analysis of concrete conditions becomes significant here.

12. It should be noted that questions of environment, resources, health, education, technologies, and patterns of livelihood have become political questions today. The scientists are forced to take positions on all these issues. Normally what the scientist and the social scientist do is to swim with the tide and please those in power to obtain the necessary rewards. Given the enormous amount of opportunities provided by the present scientific establishment, this form careerism has become the dominant tendency among the practitioners of science. For those who think differently there is always the opportunities provided by identity politics or the solace of non-scientific knowledge forms. As a result, the question of the basic objectives of science, its social functions and the basic ethics that every scientist is expected to uphold as related to questions of environmental sustainability and social change are often ignored. It is here that the PSM steps in with its clearly formulated political positions that can be verified by scientific method, at the same time contribute to the transformative agenda of every society. In the present context, this means restoring the balance between human activity and natural processes so as to ensure balance and sustainability. This applies to utilisation of resources such as land, water, air, renewable and non-renewable sources of energy and maintaining the balance of floral and faunal wealth. This also means maintaining optimal forms of human development practices, such as public health, education, housing, food security and making provisions for the existing livelihood forms. It also means development strategies that are directly accountable to the people and receives the informed and democratic consent of the people, particularly the populations directly affected by the technologies or development practices initiated. It is up to the practitioners and science and informed citizens to make meaningful initiatives in this regard.

13. It is in these efforts that fight against neo-liberalism and corporate control over science becomes relevant. Neo-liberalism subsumes all forms of knowledge under the law of the marketplace, and uses the knowledge for capital accumulation. It denies the people not only access to resources, but also denies them the knowledge to make use of the knowledge for the advancement of productive forces. It also makes use of Identity politics to persuade the people that scientific knowledge itself and not capital that is exploitative and retrogressive. In such conditions, it is important that the PSMs should lead the fight against capital by imparting to the people the elements of scientific knowledge and critical enquiry and enable them to assess their resources and form enduring livelihood

patterns. Since, capital is on the offensive to assume control over all aspects of social life it is important that the PSMs also move forward to confront them by developing people's alternatives for the sustainable enduring use of science and technology for social development. This can be done only by fighting the anti-science trends of various kinds from religious obscurantism to Identity politics and developing a secular and democratic environment of freedom for critical enquiry and practice.

14. Such struggle will take place in several fronts:

a) Fight for the right balance in the man-nature interactions that will ensure sustainable environment and socially equitable forms of development free from exploitation and social oppression;

b) Fight for public health practices that will ensure the reproduction and all-round development of human beings;

c) Fight for a scientific and democratic education system, that will unfold the capabilities of all human beings and enable them to undertake critical and scientific enquiry and practice;

d) Fight for the optimal use of land and resources, including renewable and non-renewable energy sources so that the livelihood patterns of the people are not adversely affected, and at the same time they get opportunities for transforming their material life;

e) Fight for the availability of basic amenities for the people, such as food, shelter, means of labour and energy resources, literacy, health and basic citizen's rights so that they become entitled to a just and equitable existence;

f) Fight for decentralised government forms that are sensitive to the needs and requirements of the people and able to develop scientific and democratic initiatives for social development;

g) Fight for a communication system, including IT and the media that are able to disseminate scientific knowledge and values and prepare the ground for democratic movements;

h) Organise scientists and social scientists who are prepared to take the initiative impart scientific knowledge to the people and organise their activities on a voluntary, non-profit basis;

i) Pay special attention to the specific needs of the already displaced, exploited and oppressed groups, including women and conduct campaigns for their rehabilitation, both in terms of their material life and scientific and critical awareness; and

j) Fight against communitarian tendencies and identity politics that are anti-science in nature and tend to divide the people for sectarian interests.

15. PSM has to co-ordinate their efforts with other democratic movements and organisations who share the same concerns. This co-ordination will be in the form of dissemination of positions and viewpoints, in particular scientific knowledge and perspectives, and in the form of joint action on issues of common concern. This should be combined with the fight against anti-science tendencies that tend to divide the people on sectarian community lines so that people fail to appreciate the liberating potential of science. The aim of the PSM will be to build a secular and democratic public sphere that will provide the opportunities for free scientific debate and resolution of people's problems on a fully democratic and scientific basis, untainted by the hegemony of corporate capital and sectarian community interests. Only then will the fight for a world where genuine social development takes place become possible.

Revisiting the Agenda for People's Science

(based on the address to the 44th annual conference of KSSP at Kottayam, Feb 2007)

Vinod Raina

I present again the paper I wrote for the 44th annual conference of KSSP in Kottayam in 2007 as my contribution to the invitation to present some views for discussion at the AIPSC at Trichur; anything new that I might have written would essentially re-state the same views and analysis, perhaps with some language changes. This paper attempted to trace the historical link between science and capitalism, the continued hope from the linking up of science and socialism, and the reality of contemporary times of science under neo-liberalism (the market). It went beyond the link between science and production (progress) and also attempted to explore the links between science and reason, and the strain under which both production and reason have come under the neo-liberal paradigm, which, to my mind raises fresh questions about the function of science in contemporary society, necessitating revisiting the people's science agenda. While a renewal of one's faith in the science-socialism linkage is essential; however given the complexity of the contemporary society, a mere reassertion of such faith may not be sufficient since the canvas (the socialist state or society) is itself under attack, and might actually appear to be shrinking. In the language of KSSP, Science for Social Revolution might be still be a relevant slogan, but in a increasingly dominant neoliberal paradigm that has greatly challenged, threatened and invaded the socialist agenda, PSM may also have to explore today, unlike in 1978, as to how to combine some elements of Social Revolution for Science with the dominant agenda of Science for Social Revolution.

The biggest contemporary threat to people's science is located in the fact that unlike classical capitalism, neo-liberalism does not treat knowledge as a common public good. Capitalism as expounded by classical economists, including Adam Smith, treated education (hence knowledge) as an area that would not be controlled by the market but by the state. However, neo-liberalism demands bringing in areas like education, knowledge, environment (even pollution!) under market mechanisms, which essentially amounts to saying science both as a system of knowledge and its products, must operate under market mechanisms. Since the practice of these neoliberal ideas have been vigorous

only after the early 80s, it is only now that we are witnessing the consequences. And since the ideas under which the PSM operates predates the operation of neo-liberal formulations in the area of knowledge and science, there is a urgent need to reformulate the PSM agenda, which in a welcome move, the Trichur AIPSC is attempting.

It is 45 years since the Kerala Sastra Sahitya Parishath (KSSP) was founded. For most of these years, it has been a pioneer in analysing, communicating and lobbying for science and its relationship with society. Beginning with the humble but challenging task of producing knowledge of science in Malayalam, KSSP has truly emerged as a formidable movement for realizing a science-society relationship that has equity, social justice, and participatory democracy as its guiding principles. In the process it has challenged ideologies and state power on numerous occasions and has been controversially victorious at times, as in the Silent Valley campaign. It is ironic that where as bigger campaigns were unable to force the powers and courts to see the technical, social and environmental flaws in massive efforts like the Narmada and Tehri projects, KSSP's technical and environmental analysis of the Silent Valley project persuaded the project to be shelved, even though this project involved negligible displacement of human populations compared to the other two. In later years, realizing that mere production of rational and scientific material in local languages was not enough, KSSP has emerged as a major movement in the areas of education and literacy, to reach out to larger masses with rational thought and knowledge. That it funds itself entirely from the returns from its publications is a clear indication of the extent of penetration of its viewpoint amongst the masses. Its pioneering role in building capacities for Panchayat Development Plans has shown a way for realizing the potential of decentralised democracy and governance. But it is in the integration and use of the arts, music and theatre with science, through its unique kalajathas that the vibrancy and effectiveness of the creative energies of KSSP is most visible. It is through these kalajathas KSSP was able to reach out and catalyze the formation of the All India People's Science Network and the Bharat Gyan Vigyan Samiti, the two prominent people's science movements of India. Not surprisingly therefore, it was selected to receive the Right Livelihood Award, the Alternative Nobel Prize, a decade ago.

KSSP is obviously not the only effort in the post-independence era to propagate science and rational thought in society, though it perhaps remains the largest in terms of areas of work and membership. Science clubs, discussion centers and popular publications have abounded in Bengal, Maharashtra, Karnataka and Andhra Pradesh, many of them rooted in efforts right before independence, particularly in Bengal. The British colonial rulers of course brought modern Western thought and science in a variety of ways to India, which included the setting up of institutions, academies and surveys for formal research and education in diverse scientific disciplines. These efforts were however controlled by the colonial masters, and in many ways worked with contradictory purposes ; primarily to assist the consolidation of the colonial state, but on the other hand, they also helped an increasingly larger 'native' population to be exposed to modern ideas and innovations. Consequently, the political agenda for independence led by the Congress party and Gandhi had an ally in some scientists, noticeably P.C.Ray, Mahendra Lal Sarkar and Meghnad Saha, who pursued ideas and actions located in a 'swadeshi' mould. They saw the need and relevance for propagating ideas in science and manufacture that would directly benefit the locals rather than the colonial powers. The setting up of Bengal Chemicals by P.C.Ray, Association for Cultivation of Science and M.N.Saha's journal 'Science and Culture' are some of the examples of these efforts. This spurred a number of initiatives whereby smaller science clubs and centers opened in districts of Bengal and in some other states to adopt science and its ally, rational thought, so as to equip a larger native population with these potent 'weapons' of modernity.

Support to such efforts came from political leaders, in a muted form from Gandhi but in a fiercely supportive manner from Nehru, the latter of course scripting the post-independence era of scientific temper, industry and technology. This resulted in the setting up of state sponsored institutions of science, like the CSIR, ICMR, ICAR, IIT's and similar other institutions in a short period of time after independence. The business houses, particularly the Tata aided the effort by laying the foundation of institutions like the Indian Institute of Sciences, Tata Institute for Fundamental Research, Tata Cancer Hospital and so on.

The focus of these initiatives was, on the one hand, to support the state's efforts of post-independence development, or to bring in excellence in science which would allow the country to produce and nurture the best scientific talent rapidly. This article will not dwell on these efforts since its main concern is with popular movements in science, with their focus on the ordinary masses. But it must be kept in mind that the movements do not operate independent of state efforts, and the two have deep connections. In particular, the state and the people's efforts in science, just after independence, were in many ways complementary to each other, since they had a common root in fostering a society based on reason, and a development process based on the use of science and technology that was planned and directed by the state. Philosophically, one might say, both had at their root the 18th century Enlightenment ideas flowing out of Europe.

In what follows, an attempt will be made to reveal that these roots have come under considerable strain and onslaught in the twentieth century, even as science has advanced. Consequently, state sponsored science has diverted considerably from the science of the 'people', posing serious challenges to science movements. As an example, the parting of ways of the 'liberal' state agenda and the people's science agenda came as a rude shock when the Government of Madhya Pradesh, led by a 'modern' and 'progressive' Chief Minister took the irrational decision to close down the thirty year old Hoshangabad Science Teaching Program ; a program that the science fraternity all around the country thought had the potential of scripting a an approach to science teaching for the entire country. The controversies surrounding decentralised planning and its clash with state ideology is all too familiar in Kerala. The challenges are so enormous that people like me and science activists around the country are looking up to KSSP to provide the right direction and leadership at this critical juncture.

Turning away from Science

So, what has gone wrong ? There are some visible symptoms, such as, the decreasing number of students who are attracted to sciences ; a massive upsurge in dependence on faith and religion to show the 'path'- even political - and solve problems ; and the links between egalitarianism and science, based on the notion of 'science as a public good', that have got considerably weakened. But at a deeper level, while probing the functioning's of nature, the raison d'etre of science, nature itself would appear to have been vandalized from the knowledge gained ; environmentalism would appear to be an insufficient term to describe that. Finally, from within science, aspects of quantum mechanics, chaos and complexity theories have raised questions that seem to suggest a limitation to the Enlightenment promise that science will reveal all. In a nutshell, there is a serious crisis !

Just a year ago, Prof. C.N.R.Rao, the head of the Scientific Advisory Committee to the present Prime Minister pointed out, through a letter, the grave situation regarding the steeply falling enrolments from 10+ stage onwards in sciences. The conclusion is obvious ; Indian children are turning away from science in significantly large numbers, something true for other countries too. Combined with the continuing pitiful investment in research and development in sciences, the situation appears very grim. Not only are students opting out, but the Indian state too doesn't seem

to be bothered to rectify the gross under-funding that has plagued Indian science for years, in spite of the rhetoric regarding the technological age we live in and so on.

It was a great hope at the time of independence, accompanied as it was with partition and violence emanating from extreme religious hatred, that in a deeply religious and superstitious country like India, ushering in of the scientific temper would help create more rational future generations. It was constitutionally mandated that while they would be free to retain their religious faiths, Indian citizens would adhere to forms of open debate - the essence of a functional democracy, respect for diversity, and a secular and rational behaviour, at least in public life. A considerable amount of work at grass roots by science movements has traditionally been directed to such purposes. The situation today in 2007 is however alarming on this front. The efforts of the science groups look particularly feeble compared to the sustained media onslaught by the increasing number of TV channels devoted fully to religious dogma, or other channels devoting increasing air time to irrationality ; such as numerology, astrology, vaastu, feng-shui, bhoots and so on. Even cricket is no longer exempt from such intrusions ; a channel will call sports analysts for predicting the result of a match the next day, and end the program by asking an astrologer too for his prediction ! Education and curriculum is constantly under stress for inclusion of faith based materials, be it in history, evolution, sciences or in the teaching of values. In spite of widespread protests, astrology and karma-kand did get the nod for inclusion in teaching courses during the time of the previous NDA regime, a decision that is yet to be formally reversed by the current 'progressive' UPA government.

That a Hindu nationalist political party would rule secular India would perhaps have been unthinkable at the time of independence, nor would it ever have been possible to predict, say in the ninety sixties, that the cold war confrontation between two nations, US and the USSR based on the ideological conflict between capitalism and socialism, would be replaced in the beginning of the new century by a world order with two other global axes - Islamic fundamentalism versus an increasingly Christianized US.

KSSP and other people's science groups in India have been greatly influenced by the analysis and formulations of the left British scientists, particularly Bernal and Haldane, who argued that contrary to the capitalist World where science was harnessed by private entrepreneurship for purposes of profit, if the emerging post-colonial states opted for planning and control of science by the state, the egalitarian benefits would ensure rapid improvements in the lives of the poor and deprived. The initial success of the Soviet model greatly spurred such thinking, persuading even bourgeoisie national leaders like Nehru to think similarly. The KSSP slogan 'Science for Social Revolution', perhaps, emanated from such an influence and understanding. But with the fall of the Soviet Union, and country after country being coerced or opting for integration with the global market, ideologies would appear to be falling in line with the market. For example, China has embraced the market through its less understood market-socialism thesis, and the impact is visible in West Bengal and Kerala too. The widely publicized views of the present West Bengal Chief Minister, Budhudeb Bhattacharya, in defense of the need for the left to integrate with the market, even criticizing left academicians for their marginally differing views, clearly indicates the dominance of the market ideology across the board. Consequently, skepticism has overtaken the old link between science and socialism, which even Einstein espoused, putting under considerable strain the notion of 'science as a public good'.

As graduate students in the early 70s, the joke on the campus used to be that if just three persons-Newton, Maxwell and Einstein had their theories patented, perhaps 99% per cent of everyday human activities would be required to pay royalties to them : for motion, electricity and energy. It

was inconceivable then that such a regime would ever operate. That it took less than 25 years since then for the 1995 patent regime under the WTO to be crafted sounds unbelievable. True that scientific theory is as yet outside its ambit, but algorithms and life forms are. The question is not what is covered just now, and what will be in coming years. It is the impact it has on the notion of science as a public good that is devastating. Gene patenting in particular opens frightening future vistas. It was assumed that one could patent processes that made available new inventions not directly available in nature. Nature's products could not be patented. But genes are nature's products. If you give monopoly rights to them through patenting, that in effect says that you could convert aspects of nature as personal assets, and then trade them for earning profit. This amounts to colonization of knowledge and aspects of nature in a manner similar to geographical colonization, whereby inhabitants of a country, mostly Europeans, reaching another country first would end up claiming it. So the person isolating a gene first can claim it as his personal property (including the person he isolates the gene from - an absorbing account can be found in the semi-realistic science bestseller 'Next' by Michael Crichton). Consequently, where as in yester years good scientists would brush up their oratorical and writing skills to share science with lay people in an entertaining manner, they are today perhaps closeted with patent lawyers learning skills of keeping the knowledge away from public, through patent proposals. How can such a science regime ever be socialistic, or in the cause of 'public good' ?

Therefore, whether it is in the area of science education ; spreading reason and scientific temper in society ; or the role of science in the developmental process for creating an equal and socially just society, the changed nature of relationship between science and society can no longer be ignored. This demands a serious review of our visions and perspectives, which are mostly derived from understandings prevalent from the 1930's. Since science is a global body of knowledge, a review of its relationship with society becomes particularly important when one examines the trends in its relationship with reason, human progress and nature, globally.

Global skepticism with Science

The Nobel Prize winning distinguished American physicist Leon Lederman led a research survey in 1991 which was published with the provocative title Science : The End of the Frontier. In this he contrasts today's 'mood of uncertainty and discouragement' about science with hopes of the post-war years. "Once upon a time" Lederman notes, American science "sheltered an Einstein, went to the moon, gave the world the laser, the electronic computer, nylon, television, the cure for polio, and observation of our planet's position in an expanding universe". Now, however, things look very different. As the president-elect of the American Association for the Advancement of Science that time, Lederman arranged for America's leading scientists to be sent self-completion questionnaires on their feelings about contemporary science and its organisation. The results revealed widespread gloom :

"The response paints a picture of an academic research community beset by flagging morale, diminishing expectations, and constricting horizons. From one institution to the next, across demographic categories, across disciplines of research, the nation's scientists are sending a warning. Academic research in the United States is in serious trouble".

Lederman suggests that the common theme underlying public and government attitudes toward science is a "loss of faith in the future". This is in total contrast to the bold optimism of the scientists of the past. In the seventeenth and eighteenth centuries, the pioneers of modern mathematics and science were imbued with a sense of boundless possibilities science offered in the service of humanity. Back then, science was at the cutting edge of philosophical and cultural advance. Then, the growth of science ideas undermined the dogma of religious authority and raised the

prestige of science. Despite the two world wars and colonialism, and distinct doubts about its prospects at times, science and confidence about it survived intact for much of the twentieth century. The spirit of inquiry and experimentation which had once glowed during the period of Enlightenment continued, though in a manner suited to cold war, which was very often to subordinate pure science to the demands of the military.

But that changed significantly, and the best example is the decision, in 1993, of the US Congress, backing to cancel America's Superconducting Super Collider, a facility for basic research into the structure of matter. In effect the move signaled the end of nearly half century backing for pure research. The decline of state-sponsored research and development parallels the fall of science from public grace. Pressures to curb government expenditure have led the governments to place a premium on technological spin-offs offering short-term commercial advantage ; 'gadget' making technologies that bring immediate payoff. Pure research is now held in check by governments globally.

Consequently, the morale of the scientific community has declined. In the 1950s and 1960s, top scientists joined the establishment and acquired celebrity status. In India C.V. Raman, Homi Bhabha, Bhatnagar, D.S.Kothari would be examples of such status. But today's scientists occupy a more insecure position. There is still a scattering of science celebrities round the globe, but when they do appear in public, it is more often than not to plead greater recognition and funding for science. Or else it is to defend their various projects from resource cuts and in some cases, ideologically motivated attacks.

Anti-science prejudices in society are real enough. But they are neither new nor, by themselves, a major threat to scientific advance. The real problem, as John Gillot and Manjit Kumar argue in their book "Science and the Retreat from Reason" lies in the changed relationship between science and society.

Their central argument is that 'at the center of the scientific optimism of the past lay the conviction that science was but one tool in a broader project of human and social advance. Just as the philosophers of the Enlightenment held that the power of reason could improve society, so their colleagues in the natural sciences believed that research and experiment could benefit the human condition, Science marched in the vanguard of progress'. The definition given to the word progress by a typical nineteenth-century French dictionary is worth recording here :

'Humanity is perfectible and it moves incessantly from the less good to better, from ignorance to science, from barbarism to civilization…. The idea that the humanity becomes day by day better and happier is particularly dear to our century ; faith in the law of progress is the true faith of our century'.

The 'perfectibility' of human beings and thus the project of progress through rational enquiry was first put forward by the mathematician, philosopher, and member of France's National Assembly, the Marquis de Condorcet (1743-1794). For years, Condorocet's project served as a stated or unstated principle informing the rise not just of science, but modern civilization. The situation now is very different. A better life for happier people through better science appears to be an unlikely prospect, if not an impossible dream for a large discerning humanity. Contemporary disillusionment with science, brought by its alliance with military and war, ravages on nature through over-production and over-consumption, and a diminished belief in its intrinsic power to tell us the Truth have given rise to prejudices and hostile attitudes towards particular branches of science. But it is also a symptom of a broader rejection by society, of the project of progress. And it is all too evident in the India of today. Science movements are no longer challenged only by taking ideas of science to illiterate and toiling masses. It is the very large highly educated middle class, endowed with most of the advantages science and technology have to offer, who throng Art of Living classes, Osho inspired parties,

Maharishi meditation centers, feng-shui and vaastu masters ; a clear indication that they reject the condition of human progress based on rationality. For the illiterate, lack of knowledge of science and belief in the supernatural could be attributed to a historical social condition ; for the vast educated masses, ignoring science and rationality as a basis for human progress, and to seek it through commercial spirituality is a decision based on choice rather than ignorance. The toiler might perhaps still be amenable to an argument of human progress based on reason ; but that too is being undermined by the aspirations that are being manufactured for him by the visible educated middle class ; making him believe that the road to happiness is after all to be found through blind faith in the ancient scriptures, or miracles where Ganapati 'drinks' milk, mostly in the presence of middle class people and their ally, the TV camera.

The End of Science Thesis

From the sixteenth century onwards, a series of breakthroughs in cosmology, astronomy and other fields had an enormous impact on human thinking and practice. The impact of the scientific revolution was indeed so great that the English historian Herbert Butterfield portrayed it 'as a civilization exhilaratingly new'. Since he had no experience outside the Western world, he contended that 'apart from the rise of the Christianity, there was no landmark in history worthy of comparison with the Scientific Revolution'. The Scientific Revolution represented the triumph of rationality and experiment over the metaphysics, superstition and speculation that had gone before, a reverberation that could still be felt in most of the corners of the World till the late 1960s. It was more than simply an advance in scientific knowledge ; it was a part of a wider shift in attitudes and beliefs.

The argument has been made by historians that because of the influence of scientific ideas and practices of that period, diverse areas and philosophies and key thinkers were enormously affected by it. Nobody influenced the thinkers of the Enlightenment more than Newton, as embodied in this verse of Alexander Pope written in 1735 :

Nature and nature's law hid in night God said, Let Newton be and all was light.

These lines indicate the awe in which Newton was held in his own age. That was mostly because he demonstrated how 'future' could be accurately predicted. If you threw a ball and knew its initial conditions, you could predict its trajectory, its range and so on. It was as if he really had found the key to the functioning of nature and given exact rather than religiously speculative laws of Truth. Thus science and its method, more than religion and theology, were seen as something approximating the Truth.

If two thinkers are to be identified that have dented such a view about science, it has to be Popper and Kuhn. One says dented since they, unlike Feyerabend, are not anti-science. That science is a method to seek verifiable objective knowledge/truth is what, between them, has been put into doubt. It is important to remember that most of their analysis is based on the internal assumptions, functioning's and outcomes of science rather than on external criticisms, particularly of the religious, spiritual kind.

Inductive logic is of immense importance not only in normal life, but also in science. Inductivism, the philosophy based on it, argues that science induces its laws and theories from empirical facts. In The Logic of Scientific Discovery (1934), Popper attacked the method of induction, and dismissed the idea that scientific knowledge develops when people generalize from experience and observation. From there, he argued that a scientific theory can never be proved to be true ; it can only be proved false. This was the substance of Popper's theory of falsification. Popper pointed out that though Newtonian theory had very often been substantiated by observations, Einstein's general theory of

relativity had eventually shown that it was fundamentally wrong. For Popper this confirmed that inductivism had inherent defects. 'Every discovery', Popper wrote, 'contains an irrational element, or a creative intuition', and hence has a subjective element. Therefore he opposed the assumption of an objective reality that human beings can understand, meaning thereby that natural science could not aspire to Final Truth. It is not as if Popper went unchallenged. Bertrand Russell waged a valiant battle on behalf of inductivism. But it was W.H. Newton Smith in The Rationality of Science who attempted to challenge Popper by saying that Popper wanted to have it both ways : he characterized science as the rational pursuit of truth, but at the same time held that 'the possession of truth is not recognizable', casting Popper as an 'irrational rationalist'. However that may be, it is undeniable that Popper ended up shaking the foundations of science in a substantial manner.

Kuhn's background was in theoretical physics. He began to study the history of scientific change at the Cornell Institute in Boston. When he published his inquiries as The Structure of Scientific Revolutions (1962), he created, as Gillot and Kumar say, 'something of a revolution himself. He proposed an entirely novel way of studying scientific change'. Kuhn outlined that the normal study of nature had been conducted within a body of scientific theory which had a coherence to it. He called this corpus of theories a paradigm ; say for example, Newtonian mechanics. Moreover, he felt that when a paradigm was unable to explain significant observations, and there seemed no way of resolving this, a crisis set in from which a new paradigm would hopefully emerge, say, to take the above example further, the general theory of relativity of Einstein. Till now things look okay. It was the next part that made scientists and academicians sit up reading the Structure the way they had been shaken by Popper's Logic and get greatly influenced, as before. Kuhn argued that the influence of the paradigm was so pervasive that communication between different paradigms was impossible. It was not possible to compare notes across paradigms by reference to the way nature "really was", because observations were paradigm specific : 'Like the choice between competing political institutions, that between competing paradigms proves to be a choice between incompatible modes of community life. Because it has that character, the choice is not and cannot be determined merely by the evaluative procedures characteristic of normal science, for these depend in part on a particular paradigm, and that paradigm is at issue. When paradigms enter, as they must, into a debate about paradigm choice, their role is necessarily circular. Each group uses its own paradigm to argue in that paradigm's defense'. Two related conclusions flow logically from Kuhn's thesis. First there can be no absolute basis to knowledge. Any single truth is only truthful relative to the paradigm from within which it is proclaimed. Second, there is no way of saying that some paradigms are better than the others. Each scientific theory need not be an advance on the last. Kuhn himself did not draw these conclusions. He was somewhat bewildered at to what to make of his finding. "We must explain, he said, "why science - our surest example of sound knowledge - progresses as it does, and we must first find out how in fact, it does progress". He therefore shied away from the relativistic implications of his doctrine of paradigms, but others rushed into it !

Popper dismissed any notion of progress in society, but held on to the idea that scientific theories could move forward. He could not justify this, but he was relatively bullish about the future of science. Kuhn on the other hand was unsure even about the notion of progress in science. Distasteful though he found it, the Kuhnian framework was bound to lead to postures contemptuous of science. Between the two however, they were successful in sowing the seeds of ambivalence in the enterprise of finding the Truth about nature through scientific inquiry.

Three important areas in science that have reinforced such doubts about science's ability to provide certain answers regarding nature are : quantum mechanics, chaos and complexity theories. The law of uncertainty in quantum mechanics has been the basis of endless philosophical debates ;

but what is certain is that in its accepted form, it negates causality, which was a deep concern for Einstein and formed the basis of his arguments with the non-causal interpretation (the Copenhagen interpretation) authored by Bohr and Heisenberg. The uncertainty principle is clearly at variance, even after the corresponding principle proposed as a bridge, with the classical view of nature and its functioning that was at the heart of Newton's mechanics, and its impact on a larger world view. Theologians have lapped this up with glee and a majority of popular books - authored by Capra, Paul Davies and so forth – after contending that the uncertainty principle is proof that there is no 'objective' knowledge/truth outside the observer that science can discover, seductively propose that all knowledge is therefore subjective and that 'theology subsumes science' ; just as zealous Hindus contend, for different reasons though, that Mahabharata and Ramayana subsume all the modern scientific discoveries, while providing a more comprehensive - read spiritual - world view than the reductionist and materialistic world view of science. Prejudiced readings of the uncertainty principle have been constantly used to debunk the contention that the path to unraveling the functioning of nature and its workings is through science, and in presenting the case that religion and metaphysics are the only routes to achieving such an objective.

About quantum mechanics, we can say that it has a somewhat incomplete character, but it however does capture a deep aspect of physical reality. With theories of chaos and complexity, there is however a much less consensus. They are both linked by the fact that both are products or aspects of non-linear systems. A linear system is one in which different factors, or variables, interact in such a way that the overall outcome is the cumulative effect of relatively independent causal agents. A non-linear system does not have this property. Rather, a change in one variable affects the actions of another, even if it has not changed itself. Thus it is assumed that the flapping of the wings of a butterfly in Brazil may induce a snow avalanche in the Himalayas ! Whereas there are well-known specific examples of chaotic and complex systems, like in weather, number theory, information theory and dissipative systems, the assertion that the universe is essentially chaotic and complex is at the heart of the assumption that we cannot use methods of science to understand it, since 'unpredictability' is at the heart of chaotic systems. With leaps of faith, chaos and complexity, both regarded as legitimate areas of study in sciences with names like Lorenz, and the Nobel Prize winning Ilya Prigogine attached to them, have been used to assert that the universe is unknowable through scientific reasoning, Darwinian evolution is thus rendered questionable, and hence, creationist views about the origin of life are made to seem plausible.

Finally, in a much debated book by the senior writer of Scientific American, John Horgan in 1996, titled 'The End of Science', it is argued that nothing much remains to be invented and discovered by science ; that it has reached its logical end. The foregoing therefore constitute matters internal to questioning the supremacy of science as a method for seeking answers for nature's functioning, which otherwise gave it such an exalted stature in the Enlightenment period and up to, perhaps the late 1960's.

Science has ravaged Nature

Science is not under stress from only within, but much more so from the outside. And the major disenchantment with science would seem to have been signaled by Rachel Carson's account of the damages to the environment in her pioneering book, 'Silent Spring'. Since then, the damage scientific advance has caused the life supporting systems – water, air, food, energy, living cells and life molecules like DNA as in cancer, and now climate, have constituted the most serious questioning of the scientific enterprise. These apprehensions and criticisms reach a high when a Chernobyl or a Bhopal happens, with a fatalism that such disasters will continue to happen till science is checked.

These apprehensions seem valid when the changing systems of political control of science, from the public to the profit seeking corporations are factored in. With profit as the single motive, scientific understanding of the workings of Earth and nature are seen as commodifiable knowledge, pushing corporate greed into an ever-expanding spiral ; with little regard to the ecological systems that make life possible, in the very first place. This is seen by large sections of society as a mass death wish, for which science itself is responsible, and not the systems of political and social control under which it operates.

Similarly, with wars as a never ending phenomenon, the hope that science would lead to a saner, rational and just society have receded. If the two World wars were not enough, the Korean, Vietnam, Palestine, Serbian, Kosovo, Kashmir, Iraq and Afghanistan wars, to name only the well known ones seem to confirm the apprehension that the burgeoning war industry and its technological advancement will create a war if one is not on the anvil, such is its momentum. As the weapons of death are technologically perfected to perform better, with less risk to the perpetrator, the sickening feeling persists that war will remain as a inevitable outcome of scientific advancement rather than the other way around – that scientific advancement will increasingly make wars redundant. Therefore less technology would today appear to be a step towards peace.

Finally, the retreat of the public common, even in systems of knowledge, has increased the fears that personal and corporate competition will ensure the violation of values and principles such as democracy, equality and social justice, and technological superiority will ensure the control by the fittest. Patent, trade and financial systems are shaping technological choices where by the weak are seen as a disposable population ; enhancing the notions of racial and genetic superiority. These fears are particularly highlighted when 'scientific' papers are published proclaiming the 'inferior' genetic make-up of 'poor Third World' populations, with the accompanying solution that it is best to let them die young in order that they do not contaminate the 'superior' genetic material of the First World ; as in a paper in 1990 in the prestigious medical research journal Lancet that asked WHO to stop the oral rehydration programme of children with diarrhea in poor countries, and deny water to them since their death was in the larger interest of a genetically superior world. The other example is Lawrence Summer's (at World Bank then, later President of Harvard) defense of export of 'dirty' industries to Third World countries, since it made 'economic sense' ! That this recommendation was made after the Bhopal disaster is particularly galling.

Taken together, the idea of progress appears reduced today to finding a foothold in the systems of power by hook or crook, and harness the products of technology - the cell phone, internet, transportation, audio-visual – as weapons for such a purpose and no more. Science and technology would thus appear more as instruments for instant gratification, rather than as sources of deeper human progress. Thus science has advanced, and is advancing, but reason and human progress appear to be retreating.

Where do we go from Here

As science activists, what ought we to do ? First of all it should be clear that there would be nothing more unscientific than to be unaware, or even worst, ignore such a changing relationship between science and society and conduct business as usual as we have been doing since the mid-sixties. The future agenda must therefore be based on review and consolidation.

In particular, it would appear that a new progressive and radical formulation of the relation of science and society has to be debated and forged. The roots of the science movement in India, essentially in the Bernalian formulations first appearing in the 'The Social Function of Science' and later in 'Science in History' need a thorough review. For the 'old left' scientists of Europe in the late

nineteenth and early twentieth century, approval for science and its boundless frontiers were never a question for debate. In 1954, J.D. Bernal wrote in 'Science in History' :

'The transformation of nature, along the lines indicated by the biological sciences, will be undertaken with the use of heavy machinery, including possibly atomic energy. All the river basins of the world can be brought under control, providing ample power, abolishing floods, droughts, and destructive soil erosion, and widely extending the areas of cultivation and stock raising…. Beyond this lie possibilities of further extending the productive zone of the world to cover present desert and mountain wastes and making full use of the resources of the seas, and beyond that again lie the possibilities of microbiological and photochemical production of food'.

This may sound incongruous today, even to 'non-environmentalists', but for Bernal, science made anything possible. Similar uncritical approval of science, days after the bombing of Hiroshima and Nagasaki came from the French physicist and Communist Party member, Fredric Joliot-Curie when he argued "I am personally convinced that, despite the feelings aroused by the application of atomic energy to destructive ends, it will be of inestimable service to mankind in peacetime", a sentiment inherent in the hotly contested Indo-US nuclear deal that is gripping the nation today. Most of the Western scientists with socialist views of that era were at first convinced that these potentials of science would be best harnessed by the USSR rather than the capitalist Western countries. But by the 1960's people like Bernal and Joliot-Curie came to terms with the system they had earlier despised. Because the old left reduced progress simply to the advancement of science, it saw the economic and science booms of the early 1960's, spurred by the cold war, reason enough to join in government initiatives in science and technology. For example, Bernal became an advisor to the Harold Wilson's government from 1964-70. They now made the reform of the system as their agenda, giving up their critique of the capitalism's inability to harness science for people. Gradually however, such radical scientism disappeared from Europe completely, since its proponents could not keep pace with the realities on the ground. It was replaced first by the 'new left', characterized by E.P. Thompson and C. Wright Mills and soon however by the second wave of the 'new left', led by people like Herbert Marcuse, Adorno and Horkheimer, that rejected Enlightenment and questioned science's claims to supremacy. Combining with the Green's, it produced a rather confused brand of 'left postmodernism' that is still prevalent in Europe. European scholars and their counterparts in the Third World have also collaborated in Post-Colonial studies to assert that instead of relying on ideas of Enlightenment and Western science, which are seen as instruments that made colonization possible, the newly independent countries ought to use their hard-won freedoms to resurrect their own traditions and cultures as a basis for etching out their identities, rather than continue to have their minds colonized by the ideas of Enlightenment.

This has had reverberations in India too. Spurred on by the 'Statement on Scientific Temper' brought out by a group of scientists in 1980, a formidable hostility to the statement and science in general emerged with Ashis Nandi, Vandana Shiva, Shiv Vishwanathan and Claude Alvares as its main protagonists (various versions of this confrontation are available, Meera Nanda's book Prophets facing Backwards (2004) contains one of them). Interpreting Kuhn, relying on Feyerabend's anti-science formulations and the European postmodernists, using ideas of ecofeminism and invoking Gandhi, they have led a spirited and sustained confrontation with the ideas of Enlightenment and the superiority of science as a method of harnessing knowledge ever since ; calling their formulations as alternative science. In Meera Nanda's view, such stances and positions come very close to that of Hindu Nationalist criticisms of science based on religion. She is therefore critical of the science movement, and in particular of the KSSP, for not taking up the challenge of confronting religion head on, and instead muting their efforts in spreading reason and science by bringing in other

distracting concerns, like environment and sustainable development. Her view is that by doing so, KSSP and the science movement has in a way succumbed to the arguments of the Indian postmodernists. It is curious that Gillot and Kumar also identify the environment movement and the Green's as agencies chiefly responsible for weakening the agenda of science, a view that has been forcefully refuted by John Bellamy Foster in his review of their book. As for Meera Nanda's criticism of the science movement and KSSP in India, I feel her understanding of the work of the people's science movement and KSSP is somewhat selective and limited, particularly with respect to issues related to natural resources and their control. Her other criticism, that the PSM's have not confronted the Hindu fundamentalists head-on regarding religion (she calls it the Marxist priority on economism and aversion to cultural issues) is perhaps because of a lack of understanding of strategies that practitioners working on the ground require, which need not be a constraint for writers and researchers, particularly if their writings are not likely to bring in retaliations causing physical harm, and affect their jobs and other securities. It is easy to be very radical when comforts and securities are not likely to be threatened. One can even be foolish when such securities seem guaranteed, like the Danish paper that decided that enough was enough and deliberately published cartoons lampooning the beliefs of a particular religion, with disastrous effects around the World. Richard Dawkins recent book, The God Delusion however provides a source of fine analysis, and it would be a challenge to work out how to use it in large science communication efforts here in India. The essential challenge in a country like India would appear to be to work out a method where reason and science can be propagated, without threatening the belief in the Sacred - which is something different from a belief in a God that exists in the form of man. Buddhism could be a source for that, but more about that later.

The foregoing constitute reasons why uncritical adherence to the old European left's views on science needs to be reviewed - which does not mean discarded - here in India, and a new progressive position, that is different from the European second new left, engages with the criticisms of the Indian alternative-science views and confronts the religious fundamentalist onslaughts needs to be worked with a great amount of seriousness. Obviously, in spite of somewhat exaggerated criticisms that environmentalism has compromised science (after all it is science that has confirmed the prospects of climate change, in spite of manipulations by corporations to show the contrary) limits to the use of Earth's resources, and respect for the rights of the poor and deprived to these resources should guide a proper choice of science and technology under a new formulation. A number of elements that could constitute a new radical position regarding the relationship between science and society have, in my opinion, already been practiced by the KSSP. The task I think is to work them into a new perspective that could provide widespread guidance.

What is clear is that a science communication strategy that 'sells' science in an uncritical manner is unlikely to be effective. The middle classes, as already pointed out, are increasingly hooked on to commercial spirituality and the market, to fulfill their dreams and aspirations. The 700 million rural inhabitants are more the concern of the science movements. It might be wrong to assume that they are ready subscribers to the scientific view today. Not because they have suddenly read Popper or Kuhn, or have become aware of chaos and complexity theories ! Most of this population is agricultural based and for sixty years, state sponsored media has been reaching out to them to tell them how 'scientific' practices of agriculture could improve their lives. But in a short period of ten years, agricultural growth rates have fallen from 5.8% of the GDP to 1.8% ; farmer suicides, malnutrition, forced displacements to make way for developmental projects are rampant - all in the name of 'technological progress'. It is possible therefore that reaching out to such populations in the name of science may have a different response today then what it was, say in 1987, during the Jan Vigyan

Jatha. Therefore instead of assuming an inherent superiority of science, a'la NCSTC, and launching a program for its popularization without finding out what ordinary people feel about science today might in fact be quite unscientific. The better approach might be what NCERT has finally put into practice in the area of children's education, that of 'constructivism' (not to be confused with the cultural constructivist approaches of postmodernism, it is meant more in the Vygotsian sense here) ; constructing on what people already believe, know and practice about science and technology, howsoever rudimentary it may be. Respectful and gentle persuasion to wean away from the irrational, building on the already existing positives, and being critical of what impoverishes would seem to be the right way to go. This may require approaches somewhat different from what we have been customarily practicing, and one of them would appear to be to make the Dalits as an ally of the science movement. If there is one tradition in India that one can construct upon in terms of reason and experiment, and transform into an Indian Enlightenment, it is the Buddhist ; particularly as interpreted by Ambedkar. Having criticized Meera Nanda for her disappointment with the science movements and KSSP, it is time to pay her compliments for aptly concluding the chapter on 'Buddhist view on Science' in her book thus "Ambedkar is an exemplar of what I call a prophet facing forward. Like the philosophers of the French Enlightenment who turned to the humanistic heritage of the Greeks in order to break with institutionalized Christianity, Ambedkar turned to India's Buddhist heritage in order to break with institutionalized religions and the worldview they sanctioned. In Buddha he could find those traditions which satisfied the demands of reason and naturalism as they have evolved in modern science. Ambedkar accepted the universal legitimacy of science. He understood that modern science had made a break with the sacred sciences of the past. As a victim of Hinduism's sacred cosmology, he welcomed this break and sought to institutionalize scientific reason for the pro-Buddhists by interpreting it as the essence of Buddha's teachings……Ambedkar, unlike the Marxist critics of religion, never dismissed the need for the sacred in everyday activities. In Buddha he found a way to combine a view of the sacred that did not offend the dictates of reason'. The Ambedkaraite tradition therefore provides a basis for the "friends of the oppressed in post colonial world to recognize that the interest of the oppressed in secularization and demystification of traditional ideologies is best served by the naturalism and skepticism of modern science. It would be fair to say that modern science is the stand point of the oppressed". One of the ongoing problems in India has been the refusal of the left to consider caste, along with class, as a defining category to describe the Indian situation. Perhaps that and the generally upper caste leadership seem to have influenced the left leaning science movements too. But there seem to be welcome signs of change in this. At least one of the major left parties, the CPM, seems to have put the Dalit agenda high on its priority ; by even calling for a week long conference, 'Reaching out in the Hindi Areas' before its last party session in Delhi in 2005. This needs to be replicated in the science movement too, and a much broader front encompassing various Dalit organisations might go a long way in reconstructing the agenda of reason and science by combining the Ambedkarite tradition, at the same time reaching out to much larger oppressed masses.

Finally, what about science as a provider of knowledge ? Can we still hold on to the view that it is a superior means of acquiring knowledge ? Yes, provided we give up the arrogance that it is the sole route to Absolute Truth, whatever that means ; which requires us to show that it is more likely to yield justified beliefs than any other methodology. Thus the real issue is not whether a belief is scientific or pseudoscientific but whether it is justified or unjustified. We are justified in believing something to be true when it provides the best explanation of the evidence. Science is superior to other methods of inquiry because it usually provides better explanations. The problem is that most people never learn the difference between a good explanation and a bad one. So our education must

focus more on how to think rather than what to think. An educated person should be one who learns how to question the answers, rather than answer the questions. In the age of rapid information, learning how to sift reliable knowledge and information from the junk is of utmost importance then discourses about absolute truth and false. Only a person who knows the difference between a justified and an unjustified belief can truly appreciate the value of scientific inquiry. Here too, the science movements need to reflect on their efforts. It would appear that a majority of their work is devoted to passing on scientific facts and information, without dwelling on the method of inquiry that led to these facts. In creating a critical mind, what is not so important are the facts of science today, but the manner in which they were obtained, which requires a pedagogy that stresses 'Not what we know, but How we got to Know' (Asimov wrote a whole series like that). Such a pedagogy is not very easy to practice, since it requires using the historical analysis as a basis ; and most of the writers and editors in the science movement are not trained that way. I learnt that the hard way, and could practice it inadequately, while engaged with the publications of Eklavya, including editing Chakmak. KSSP pioneered bringing out non-English materials in science many years ago. It is time they show the way to bring out such material in a critical manner, not once a while but month after month !

Sources and suggested readings :

1. John Gillot and Manjit Singh ; Science and the Retreat from Reason, Monthly Review Press, 1997
2. Robin Dunbar ; The Trouble with Science, Faber and Faber, 1995
3. John Ziman ; Reliable Knowledge, Cambridge University Press, 1978
4. John Horgan ; The End of Science ; Little Brown & Co, 1996
5. John Bellamy Foster ; Science in a Skeptic Age, Monthly Review, June 1998 (review of John Gillot and Manjit Kumar's book)
6. Richard Dawkins, The God Delusion, Bantam Press, 2006

A Manifesto for People's Science Movement

M.P.Parameswaran

People all over the world, today, are divided into two very broad classes: those who are continuously getting impoverished or facing the threat of impoverishment, either absolutely or relatively and, those who are getting continuously enriched both absolutely and relatively at the expense of the former and also at the expense of planet earth.

In the phrase *People's* Science Movement (PSM), the term *people* refer to the first category, the class which is getting continuously impoverished. The PSM is partisan towards them and always take a stand in favour of them and against the latter, wherever their interests are in conflict.

Science here means all branches of knowledge - social science and natural science, pure science and applied science, engineering and technology. It originates from humans - nature interactions and human-human relationships. It views humans and nature in the frame work of three, mutually interacting subsystems. The *physical biological system* consisting of everything living and non-living the subject matter of natural science, engineering, technology etc. The *socio-economic system*, comprising of human actions on physical biological systems and the relationships amongst humans - the subject matter of 'social sciences' and *cultural subsystem* comprising of concepts of humans, both individuals and collectives, about themselves, about their relationships with each other and with nature - the subject matter of the so called 'humanities'.

Human history and human progress can be seen as a continuous enhancement of the knowledge of the behaviour of living and nonliving matter around them and their skill in utilizing this knowledge to better their on living conditions. This knowledge (head) and skills (hand) have enabled the species to outwit all other species and to survive hostile environment. In the process, however, humanity increasingly got divided into two broad groups, one with only skill to manipulate the nonliving world and another with the knowledge and skills to manipulate persons. The former got continuously 'impoverished' and the latter, continuously enriched. In this their knowledge and skills helped them considerably.

The word *movement* in People's Science Movement implies continuous deepening of knowledge and manipulative skills of the impoverished majority and its continuous expansion into larger and larger sections of them.

The People's Science Movement was initiated by the Kerala Sastra Sahitya Parishad (KSSP - meaning Kerala Association for Science Literature). Started as a science popularization organization, KSSP got transformed into a People's Science Movement which spread all over India. The majority that was getting impoverished were increasingly able to see and understand how the minority is using its knowledge and skills to perpetuate it's hegemony and, consequently, resist it more and more effectively. The ultimate success of the majority to stop and reverse this impoverishment is termed as "social revolution" and led to the adoption of the slogans "science for social revolution."

The 'present world' is unacceptable; another world is necessary, because:

- competitive capitalism has no alternative but to go on increasing production, to go on concentrating resources and power in fewer and fewer hands, to go on extending the power of lesser and lesser number of individuals to take decisions which affect the lives of more and more people.
- this leads, to accelerated depletion of limited natural resources, to increased conflicts to take control of them and to mutually assured destruction.
- increased production or transformation of natural resources into un- 'natural' products, leads to accumulation of 'wastes', many of which are harmful to life. They pollute land, water and air. They cause substantial changes in the composition of the atmosphere and lead to atmospheric warming. This upsets long established energy balances and movements, causing chaotic changes in weather, upsetting seasons and generating hurricanes, storms etc. All these are experienced facts.
- it leads to fragmentation of the human society into individuals, each for himself, and destruction of collectivity which was one of the pillars of evolution and survival of the species.
- delay in realizing the impending dangers is likely to lead the species to a point of no return, to absolute barbarism, if not to total destruction.

Since humans can foresee all these and since they do not want self destruction they shall strive for an alternative world, a world where these dangers are averted, where the species can continue to evolve socio culturally and cross the threshold of liberation from animal limitations.

The alternative world is necessary not only for the future but also for the present which is a hell for the majority in Asia, Africa and Latin America and, yes, even for many in developed countries of Europe, North America, Australia and Japan.

In these developed countries, since each has to run faster and faster to keep one's place, the working day (including work related travel time) has been growing longer and longer. This work is not of one's own choice, of the type Marx and Engels wrote about in *German Ideology* but is forced upon them as a necessity to earn a livelihood. The situation is not much different from that of primitive societies, whose major preoccupation was to find food and to survive. They were always at the risk of being attacked and of being without food.

All the communities in developed countries and in larger towns and metropolitan cities of developing countries always feel insecure. Humans want security for themselves, children and grand children, at least. The neo-liberal world cannot offer this. Hence the necessity of an alternative to capitalism.

This alternative to capitalism is generally considered to be socialism. There is, further, a very broad agreement that this socialism cannot be the same as what actually existed in the 20th century. It lacked most of the elements of socialism as conceived by Marx and Engels.

Marx did not conceive 'socialism as 'capitalism without capitalists' or state capitalism. He did not conceive it as catching up with capitalism and surpassing it in consumption. He did not subscribe to metropolitanization and concentration of population. The Manifesto asked for continuous de-urbanization, for rurbanization, with agriculture and industries uniformly dispersed. He was concerned with the rupture of nature's metabolism. He stood for intergenerational equity and long term sustainability. The 20th century socialism was just the opposite of all these.

Post capitalism need not automatically mean socialism. It could be barbarism also, as Rosa Luxemburg had put it hundred years ago. It could be, also, total destruction of the species, as is feared by many today. If it has to be socialism, one which is different from what existed in 20th century, one has to consciously plan it and work for it.

In this aspect the social revolution PSM conceives is qualitatively different from earlier bourgeois revolutions or feudal revolution. Neither feudalism nor capitalism emerged from the preceding societies, as a result of conscious futuristically planned action. However this revolution - we may call it a socialist revolution - can only be the result of conscious and planned effort. The spontaneous product will be only barbarism, if not extinction.

We are, so to speak, today at a point of historical singularity : at the verge of species extinction or of emancipation. A socialist revolution, as accepted, obviously means not change in mode of exploitation but end of all exploitation.

Emancipation can be stable only on a global scale - a new form of "globalization", of "emancipation." It does not follow that it should be preceded by a "global dictatorship of the proletariat". Experience so far shows that dictatorship - state centralized in the hands of the party of the working class - does not lead to emancipation, even in one country. A global state in the hands of a single party is unlikely to yield different results. Dictatorship does not encourage democracy or social control.

The future socialist revolution, if we agree to call it so, cannot be a global 'event.' It has to be a global expansion of "local events" of "globalization of localism." It will involve freedom from faraway (global) controls, local autonomy in politics and economy, while retaining global connectedness, knowledge exchange, cultural exchange and minimum necessary division of labour.

'Local' need not necessarily mean a nation-state. Most of the nation states are too large for effective participation of the people, for effective control on their own lives. This gives us some clues about (i) the structure of the future society, of the alternative or another world and (ii)strategy and tactics necessary to realize it.

The cardinal features of the alternative could be listed as follows (All may not agree with a them. Many may feel that there is no meaning for life without competition, without ever increasing consumption etc. But a large majority is likely to agree with the spirit of the following).

- Abolition of private property in land and other means of production and bringing them under social ownership. No exploitation.
- Increasing abundance of the means of subsistence.
- Increasing equality
- Decreasing difference between town and country, between industry and agriculture and restore nature's metabolism - rurbanization.
- Emancipation from all forms of alienation.
- Continuous improvement in the health of the land which is to be passed on to the next generation sustainability.

These objectives can be achieved only at national state level and that too only partially. Ultimately they will become stable only at global levels. There will have to be a transition period which could be quite long, zig zag with ups and downs. There have to be certain indicators which reassure us that we are moving in the proper direction. Steady increase in Physical and Spiritual Quality of Life could be such an indicator.

This means :

- Increase in life expectation, decrease in morbidity and infant mortality rate, across the population, especially among the impoverished majority.
- Continuous reduction in income inequities, reduction in Gini co-efficient.
- Increased democratic participation of the people in running the affairs of the society.
- Improved status of women.
- Security for children and the marginalized,
- Reduced use of energy for achieving the above.
- Reduction in the rate of emission of greenhouse gases and ultimately reduction in concentration of the same in the atmosphere.
- Continuous reduction in the unnecessary transport of goods and travel of humans.
- Increasing local self sufficiency.
- Continuous reduction in the relative spending on armaments, police, judiciary, prison etc. relative to education, health care, social security etc.
- Continuous reduction in the production of goods and services with low, zero welfare values, vanity values and destructive values.

It will also demand a 'new economics' differentiating use value into welfare value, vanity value and destructive value; incorporating such categories like need and greed; quality of life; development, equality, security, sustainability, wastage index, dehumanization index, participation index, self sufficiency index.

The general structure of the new, alternative world will be different from the present one. Nation states will lose their importance. The human society will become a global network of associated producers. In this, each association will be at the centre surrounded by a number of federating circles, which are not hierarchical, but horizontally related.

To make such localization possible, the Research and Development work in Science and Technology will be so oriented as,

- to extract solar energy cheaply and abundantly.
- to convert anything into a resource, to do away with the concept of 'waste.'
- to sequester green house gases from the atmosphere.
- to make small scale production both efficient and economic.

Local economies have to be built up, based on the above. Local production of increasing number of goods and services, local marketing, local pride, local alterative currency, local and inter connected security measures …. all will have to encouraged. Such economies are to be experimentally built up wherever possible. They will form the base on which future society can be built. They will also function as forts of resistance against the onslaught of globalised neo-liberalism.

The left and the progressives are engaged in a struggle against neo-liberal globalization, throughout the world. Many among the left, including the communists believe that, currently there is no other

option than to enter into the world market and fight it out there. Many even theorize that without going through full-fledged capitalism, which alone is capable of developing productive forces, it is not possible to think about socialism, that the failure of the 20th century experiments was due to attempts of short circuiting capitalism.

This is a dangerous argument. This path will eventually lead humanity to barbarism or extinction not to socialism. Building up of small islands of the socialistic societies is possible and this should be a major task of the left and progressive movements, and also of the PSM. A local economy movement is, also, a counter attack on globalization. The battle ground for such a counter attack has to be the place where the enemy is situated - the Market. That is his forte. We have to attack him at the local market- the village market and the town market. We can use price, quality, education, localism, patriotism etc. to oust the neo-liberals from our markets. Yes, boycott is a powerful weapon. The left and progressive forces have to realize the great potential of boycott and local movement.

The PSM in India is only three decades old. The term was coined at a national meet of 'similar minded organization' held in Trivandrum in 1978, to connote the "similarity of minds". Elsewhere in the world too similar ideas have cropped up and organizations formed for it. However the PSM in India has a more comprehensive view of the society, and a more extensive plan of action relating to virtually all aspects of human existence. In this way, it can be considered as the most advanced PSM. However this 'advancement' is still too small, only a few steps in the very long voyage ahead.

When we speak of a 'long' voyage ahead we have some notion of the distance to be traversed and of the destination to be reached. We want to traverse a path which will reduce knowledge, skill and livelihood inequalities to a bare minimum - a continuous reduction (instead of the current increase) in the Gini coefficient of knowledge, skills, income, status etc.

Political movements (of people) aim at reducing income inequalities using the state power as the instrument for the same. Science movements use enhancement of knowledge and skills as a complementary strategy. Education in its broadest sense is, therefore, the major most area of its activity. Young and old, man and woman, illiterate and educated all come under the purview of citizen education. Many PSMs, in Kerala and elsewhere, started with 'science communication' to grown up citizen and small children. In a country where 30-40% is illiterate, where another 20-30% has not gone beyond primary level education has a much broader meaning. It starts from basic literacy for the entire population. But that alone will not help the impoverished fight impoverishment. Neither SSLC or degree will be sufficient. The entire population belonging to the impoverished majority should acquire knowledge and skills on par with those of the richest ten percent - knowledge in science and mathematics, English and social sciences and skills in computer usage, in management, in human relationships etc. Till then the present situation of a minority getting enriched at the expanse of the majority will continue. Educational inequality reinforces economic inequality and vice-versa. PSM strives to bridge the knowledge divide and through it the economic divide. On the other hand progressive political parties sympathetic to the impoverished majority strives to reduce income divides and through it knowledge divides. The two are mutually complementary.

Peoples Science Movements are involved in, seemingly, a large number activities - environment, health, energy, research, technology, economic planning, gender equity and so on. However, the role of PSM in all these is one of education, using activity as a pedagogic tool. The PSM learns continuously, it assimilates knowledge and skills from every conceivable source and shares them widely amongst the impoverished majority. Thus knowledge can be informative, ideative and provocative. PSM is involved in spreading all the three forms of knowledge.

PSM abhors the concept of "intellectual property." Property is something dead. It gets diminished as we give it away. Knowledge does not get diminished because of sharing. In fact it gets enhanced. Human species has been accumulating and assimilating knowledge and skills over thousands and thousands of years in widely different parts of this planet. Much of it is outside the realm of 'intellectual property'. It is open to all. If pooled and universally shared it is enough to produce all the goods and services required by the entire population of the world, present and future, and achieve a very high physical quality of life, in a sustainable manner to be enjoyed by thousands of generations to come.

The PSM recognizes that much of the products of the present day world do not bring in real welfare to humans. They have only vanity values or even destructive values.

The PSM recognizes that the two categories of need and greed are distinctively different, that this world has enough to satisfy everyone's need, but not their greed.

The PSM realizes that continuous expansion of production of goods and services to satisfy greed of humans necessitates increasing hours of compulsory labour and deepening of alienation.

The PSM understands the true import of the statement of Karl Marx that human species is at the threshold of liberation, getting ready to make truly human history, transcending the animal stage.

The PSM, also understands, that without attaining the wisdom to differentiate need from greed this transition, this liberation from animal existence to human existence cannot take place.

Based on this understanding the PSM strives to reach out to every nook and corner of the world, to every community in the world, to assimilate all the knowledge and skills available with them and share them widely. The activists of PSM are severely handicapped in the execution of this mandate due to their low educational levels and low skills in the use of English language and computer. It is the duty of every PSM worker to study continuously and to become adept in English language and using computers to get access to the immense treasure house of global knowledge and get connected to similar movements world over.

Appendix I

Desh Ko Janein, Desh ko Badlein

A Draft Concept for Action

Introduction

The concept of "local self governance" with panchayathi raj institutions as its instruments is a very potent one. As any other potent concepts, only through conscious planning and application its potency will be realized. The DJDB programme is an attempt to realize this potency. Panchayats are revolutionary only if they are creative and if people at large participate in its affairs creatively. This requires strengthening the capabilities of the people to understand and to act.

This is a modest experiment, in relation to the size of the nation and at the same is also a gigantic experiment when viewed in itself. It envisages encouraging and helping people to identify their local problems, recognize their resources, formulate solutions and finally act upon them. The programme will take place, hopefully, in 10000 GPs distributed in about 300-500 blocks within 100-200 districts spread all over the country. The following activities will take place in each panchayat (A population of 5000-6000 people is taken as a standardized panchayat)

Issue to be discussed at the grama sabha. The dialogue/discussion could be organized preferable in each gram sabha of the panchayat. There will be 5 to 10 gram sabhas in each panchayat. In the rare cases where its composition (say of landlords and labourers) makes participation difficult for certain sections, it can be split into two or three discussion groups.

The discussions may be held during evenings or holidays; over a period of two months. Each session should produce a two-three page note summing up the basic conclusions.

The discussion is organized into four basic subject areas or modules. Some of them may require more than one session. In all 10-12 hours of discussion will take place in each group. To guide the discussions a large number of questions can be framed on each topic. They are only to help the Panchayat Resource Persons to formulate their own set off questions which are relevant and meaningful to their area. Each subject / topic may be discussed under the following broad framework:

a)Status b)Problems and causes there of c)Possible solutions d)How to proceed & e)Resource requirement

At the end of each days discussion a two-three page note highlighting the major problems raised by the citizens, their suggestions to solve them, their general impression about the state of affairs in their village and in the country etc. should be prepared by the source persons who leads the discussion.

DISCUSSION TOPICS

A. Basic Needs and Livelihood Issue

A.1. Food : Agriculture, Animal Husbandry, Pisciculture, forestry etc.

A.2. Land and Water : shortage, excess, erosion management.

A.3. Employment : Skilled, unskilled, artisanal, manufacturing, service etc.

A.4. Infrastructure : Energy, transport, road, communication

B. Health and Education

B.1. Nutrition, Drinking Water and sanitation

B.2. Primary health care

B.3. Education : Preprimary to high school

C. Self Governance

C.1. Neighbourhoods, gram sabha, gram panchayats – Rights and responsibilities, participation of women and dalits

C.2. People's participation, accountability and transparency

C.3. Local and Common Resources Management

C.4. Panchayats in some other states.

D. Society and Culture

D.1. Problems of dalits

D.2. Problems of women

D.3. Problems of culture : art and literature (library) communal harmony and co-operation; corruption and criminalization

CURRICULAM FOR NATIONAL RESOURCE PERSONS

GENERAL OVERVIEW

Fifty years of Indian Independence

O.1 Economy and development

O.2 Indian polity

O.3 Indian and the world

O.4 India : Society and Culture

SECTORAL OVERVIEWS

S.1. Agriculture, animal husbandry, pisciculture

S.2. Land and Water : Management, waste land development, degradation, resources etc.

S.3. Industry : Large and Small, modern and traditional

S.4. Energy, transport and communication

S.5. Nutrition, drinking water, sanitation and primary health care.

S.6. ECCE, Elementary, secondary, nonformal continuing and Vocational Education

S.7. Higher education

S.8. Neighbourhoods, gram sabhas, panchayat participation of women, of dalits etc.

S.9. Panchayats : resources, authority, peoples participation, responsibility, accountability and transparency.

S.10. Deprived Sections : Scheduled tribes, scheduled castes, social tensions, economic problems, culture etc.

S.11. Gender equity, attitude towards women in participation, violence against women etc.

S.12 Society and Culture : art and literature, caste and religion, harmony and cooperation, corruption and criminalization.

PLANNING

P.1. Primary data collection : resource mapping, socio economic survey

P.2. Secondary data collection : nature, sources reliability etc.

P.3. Evaluation of projects

P.4. Cost benefit analysis

P.5. Prioralization

P.6. Systems planning

P.7. Gram Sabha dialogues: how conduct them

P.8. Organizing GP level Jan Samsad

Appendix II
PSM Vision India - 2030/2050

T.Gangadharan, C.T.S Nair, M.P.Parameswaran

Background

Although not explicitly stated and notwithstanding the occasional lip-service to "inclusiveness", the political leadership in India is now pursuing a neo-liberal approach, enabling national and international corporate players to ruthlessly exploit the natural and human resources without in any way contributing to societal progress. Notwithstanding the impressive GDP growth rates during the last two decades, poverty and deprivation persists. Growth is not trickling down at all; on the other hand inequities are increasing, disparities are widening, natural resources are getting depleted, livelihood of majority, especially the poor are being undermined and the vision of a modern society which is at peace with itself and nature is fading away. Pursuit of the current path of development will have disastrous impacts on the country considering that the "growth mantra" is totally ignoring the social, environmental and cultural dimensions of societal progress. With environmental challenges like climate change looming large and meaningful solutions being undermined in the context of the "business-as-usual" approach there is an urgent need to visualize a more people and environment focused scenario of India's development.

PART I

GLOBAL SITUATION

1.1. The world is linked to one global economy. Disturbances in it affect every country, more or less.

1.2. The frequency and intensity of disturbances, shocks to, crisis in global economy is growing. Though often caused by random and unpredictable action of individuals and corporations, capitalist economy, its very nature, necessitates much crises.

1.3. The corporations survive such crises mostly at the expense of the people at large, either directly through their national governments or indirectly through squeezing the entire world. In the process there occurs a net flow of wealth from the "have-nots' to the 'haves" and inequality increase, both between nations and within nations.

1.4. The second means of survival is the intensification of the use of natural resources, ie. by impoverishing the future generations.

1.5. Increasing disparities, dwindling resources and spreading insecurity lead to spontaneous and even orchestrated reactions as seen from Seattle to Wall Street.

1.6. Everywhere we can find the rich, the powerful steam rolling the poor not only economically but culturally too - their culture of consumerism, wastage, individualism etc.

1.7. Resource depletion is taking place at alarming rates, forest cover, arable land, potable water, mineral resources, biodiversity – many important metals, like copper, tin, zinc, lead etc. as well as fossil fuels like petroleum and gas are likely to be fully used up in two to four decades.

1.8. Global warming is a reality. Climate changes are taking place. Extreme events are intensifying – shrinking of glaciers – stores of pure water, less of biodiversity, fall in agricultural production, submergence of coastal lands – all are becoming evident.

1.9. Mounting avarice and dwindling resources are leading to increased use of force to gain control over remaining stocks – Iraq, Iran, Afganistan, East Timor etc. Land purchase (grab) in Africa soon will lead to violent rebellion – eco-colonialism is rampant. Millions are made refuges and the actions are justified using the principle of 'eminent domain", often a principle or plunder.

1.10. If we continue on this trajectory we are likely to face a catastrophe. Club of Rome studies of 1972, 1992, 2002 – all of them confirm this. It is difficult to imagine what will happen. If we don't change our trajectory soon enough we may have to experience a catastrophic degradation of human's civilization and fall into barbarism of a kind.

1.11. The under world, the illegal, rules over the legal society or rather the corporation rule over the society through the under world and the legal world, the executive, the judiciary, the military and even through the legislative. Politics has been almost fully criminalized except in some pockets of the society. The leading politicians are themselves criminals or pawns in the hands of criminals.

1.12. They are creating large bands of refugees – developmental refugees. Around each so called 'approved' development project there is a ten times larger illegal project. The legal and illegal government, both are against the people. Something akin to the mass massacre of indigenous populations in the Americas during 16^{th} -17^{th} centuries is taking place, throughout the world, though more subtly.

2. INDIA TODAY

2.1 India is a fast growing country. Its economy is galloping. GNP has been increasing at 7% to 8% average rate during the past decade and half. Its cities are vying with each other to become world class cities. It is fastly getting urbanized. The share of primary sector in GNP is coming down and that of tertiary sector is increasing. Metros, express ways, cell phones, computers...

2.2 India has world class hospitals; a very large array of S and T personnel, India is producing engineers, doctors and other professional in huge numbers. India is, as wishfully observed by Mr. Abdul Kalam, becoming a super-power, trying to occupy the second pole, vacated by the Soviet Union.

2.3 True, during past two decades its literacy rate has gone up considerably, enrolment in schools (though not achievement levels) has increased, it has enacted several progressive Bills like Right to Information, Right to Work, Right to Education and so on.

2.4 However, India is gigantic - with 130 crores of peoples, diverse terrains, diverse, language, diverse cultures, very uneven development, great rural urban divides, slums, ill-health, poverty, illiteracy, caste and religion animosities, there is no dearth of problems.

2.5 India, as a country, has a high population density, low availability of per capita arable land (only better than China), rich in some resources, but poor in others, poorly developed human resource, skewed ownership of natural resources, non efficient use of them. Yes no dearth of problems.

2.6 To guide through this mass of problems the country requires a very imaginative and effective leadership – unfortunately we don't have any such leader – individual or collective. There is no political party which enjoys love and respect of the people. They enjoy only an unsteady loyalty – there is a universal degeneration of political processes and institutions.

2.7 Our democracy, like elsewhere, is highly flawed, definitely *not* a government *by* the people. Nobody believes that elections are fair – money power and party muscles decide every thing – fragmentation of political processes based on caste/religions/personality, loyalties and often on muscle power.

2.8 India's human capital is very poor. Morbidity levels are high; life expectation low, though better than many African countries; malnutrition high, anemia levels high, lacking in safe drinking water, sanitation, environmental cleanliness, education, skill development. Though we dream of a knowledge society, more than 70% of the people are debarred from it.

2.9. The pursuit of neoliberal policies leads to the second wave of de-industrialization and demise of farming communities. It has converted everything into a commodity – education, health care, travel, communication almost everything. It is leading to increasing income divides, educational divides and social divides. Gini co-efficient is increasing in every sector. It is building a consumerist society, wasteful society, a dependent society.

2.10 The income inequality in India may not be as high as in Brazil or USA. But inequality in education, its Gini Co-efficient is very very high. This is pushing up income inequalities.

2.11 As in other countries in India too the informal economy consisting of grey/black money has taken over the society. Real estate, slums Swiss banks, undeclared cash and gold – The country is ruled by it. There are various estimates. Even the lowest is frightening. This makes life more and more intolerable for most of the people.

2.12. Corruption is taken for granted – at all levels. There are scams like 2G, coal fields, arms purchase etc. etc. involving unimaginable sums. The amounts involved are several time more than what is spent on education, health care, food security, PDS etc. However it is the day to day corruption experienced be people in their day to day life – in village office, in sub registrar office, in RTO office... In fact everywhere rights of the citizens are denied unless the staff concerned is bribed. There is a universal loss of faith in government and its establishments.

2.13 We are exploiting our natural resources in an unsustainable way. Coal and iron mining is increasing in leaps and bounds. Electricity is being wasted in producing useless vanity goods. Forest lands are denuded. Water sources are getting polluted. Biodiversity is being destroyed. All for quick profit for a few.

2.14 The ranks of the so called "Project Affected People" is swelling. Tribals are the greatest sufferers – coal, iron ore, manganese, bauxite , copper... all are buried deep. On the top we have forest. There live people. The minerals become wealth only when we bring them up ie. destroy the hills, the forests and the people. People are sacrificed for wealth. The history of all developmental projects is the history of forceful eviction and in fact destruction of people for increasing the wealth of a few.

2.15 The assets of corporations (table) have been increasing steeply. Thus growth is not through their cleverness, but through crookedness – Indian billionaires are crooked.

2.16 India has, in turn, begun to exploit the African countries. Indian corporations have been purchasing land, oil fields, trading corporation etc. in Africa and other countries- Examples.

2.17 The rich in India exhibit an extravaganza of a vulgar nature – marriage ceremonies in chartered planes, gold ornaments, palatial buildings, star hotels, star hospitals and what not.

2.18 Where are we going? In urbanization, in marginalization of peasants, and primary sector, in growth of slums, in growth of roads and vehicles, in commoditization of health, education, water, air, child care, social security – of everything – if we extrapolate the trends visible during part two decades to future 2-4 decades?

2.19 Will India emerge as a democratic, egalitarian society balancing the economic, social, cultural and environmental dimensions or with the rampant exploitation of human and natural resources benefiting small segment of the population while the majority remains poor? Alternative path to social progress?

3. ALTERNATIVE PATH TO SOCIALA PROGRESS

3.1 It is clear that we cannot go on as it is going on. That will lead to total darkness. We have to change the trajectory of human progress. Development, progress and growth – the fallacy of growth rate – de-linking progress from growth and re-linking it with alternative understanding of progress.

3.2 What is progress? Quality of life of a community. Material or Physical Quality of Life and non material or Spiritual Quality of Life. Elements of PQL and SQL – alienation and emancipation

- leisure - freedom – from GNP to GNH: Gross National Happiness. Bhutan's efforts to quantity GNH.

3.3 Social justice – production and distribution – conditions of production which will ensure equitable decision – intra-generational equity – social ownership of means of production - special status of land, terrain and other natural endowments.

3.4 Sustainability – inter-generational equity renewable and non renewable resources – reduce, re-use, recycle – Major immediate restraints – pollution and destruction of natural resources – water, soil, land, life style (throw away) and industrial (profit top) - threats to sustainability – Municipal waste and drainage – Mosquitoes, flies and rodents .

3.5 Capitalism and commodity production – use value and exchange value – use value: welfare value, vanity value and destructive value – examples – new economics based on differentiated use values and quality of life.

3.6 Animal life can be summed up as: hunting food, escape from being hunted, procreate and sleep. Only humans have a cultural or non material life. The success in procuring food and capability to resist hunters gave humans liesure for doing whatever she/he wants today. Increasing leisure and the freedom to use it and enjoying labour make humans superior. This is what we want for every member of the society. There are several conditions to be fulfilled to achieve this liberation. A few very rich enjoy the freedom of leisure, but not freedom from tension. Only by making all free anybody can be free.

3.7 Humans are three generational animals. They care for their children and grand children. They are highly conscious of the future security. The entire insurance business is based on this desire for security - society can assure security. In a family each member feels secure because of the concern of other members. In atomized nuclear families we don't have this, so each amass wealth - as insurance for future. Instead an entire community can assure security. Then there is no necessity to amass wealth. USSR in fifties, sixties and seventies. Liberation from anxiety about future.

3.8 Sustainability has a time element in it. How long. One generation 10,100,1000……. generations? No non-renewable resource is sustainable for ever. Recycling increases period of availability. Recycling rates of various products in various countries – also global. Non renewable means not total destruction. It means change in composition and dilution. Iron rusts and turn into iron oxide which gets into soil. To day we can't extract it back. Non rusted iron can be recycled. Development of recycling technology – wood turned to coal – burned to form CO_2 - can be converted again into wood through photosynthesis. Since no matter is destroyed, theoretically we can get it back in the form we want. We require more energy. That should be available. We require more knowledge. That has to be created. The recycling could be in several steps and stages too. How much of metals/non metals we can plan to recycle by 2030? by 2050?

3.9 Recycling demands new knowledge and more energy – which is renewable. The only source is the sun. There are several technologies. Photo synthetic, photo voltaic, thermal, desirable trajectory of solar energy harvesting, for India - solar democracy/solar socialism/solar communism.

3.10 Former President of India Abdul Kalam dreamt of India becoming a super power – economically and militarily. He wanted India to occupy the second 'pole' vacated by Soviet Union before China occupies it. Is this a correct objective? We are spending more and more resources on "defence" – resources which should have been used for education, health care, drinking water, public distribution, social security etc. Can we not settle all our border disputes and reduce the so called defense expenditure to one tenth of the present? Do we want to become militarily strong or morally strong? Do we want to become a super power or a nation of superior human beings? The trajectories for them are diametrically opposite.

3.11 We say Chatthisgarh is rich in mineral wealth. Bihar, Jharkhand, WB – all are rich in coal and iron ore. There are lying underground. Only when brought above ground they become wealth. In

the process we destroy the wealth above: forest, agriculture and above all humans. Yes, every such development destroys humans. How do we carry out a cost – benefit analysis cost of loss of forests, agriculture, biodiversity and human life. Benefit is iron, other metals, coal, energy – who enjoys the benefit? Who bears the cost? Don't we require a totally different mode of cost – benefit analysis? Can we avoid loss of human life – livelihood? So far none of the development projects has given the displaced people proper livelihood. How do we go about? How to cost it? How to counterfoil the savage principle of "eminent domain"? How to prevent rich land lords keeping their land fallow?

PART II

4. AGRICULTURE AND FOOD SECURITY

4.1 General over view of agriculture in India – historic – current –productivity of important crops – time series data for various regions – international comparisons – China comparison.

4.2 Assume current scenario of "Business As Usual" persist – pressure on small farms to sell – change from food to non food and exotic food crops – cereal production can come down, especially with erratic weather due to global warming and shortage of irrigation water – threat to food security – especially to cereals security – the rich man's food and the poor man's food – shortage of both calories and proteins – the "food divide"

4.3 Green revolution – its initial impact. 1965-1985. Side effects – soil degradation – salinity – studies of 19th century by Von Liebig and other soil chemists – the law of capitalist agriculture – profit for a few and now. Others? Tomorrow? They will solve their problems – marginalization of small and medium farmers – decreasing trend in productivity per unit external input – coexistence of high input capitalist agriculture and low input traditional agriculture – possibility of "greening the green revolution".

4.4 Primary sector has to be brought back to primacy. The different aspects of primary sector are to be planned differently and integrally. Food production occupies highest rank. India has to produce sufficient food for at least 1500 million people. At an abundant rate of 500 KG (cereals, tubers, vegetables, fruits, nuts) we have produce 750-800 MTe of food – all together. This is to be produced from least possible area with least possible labour and least possible energy and chemicals input. Optimum combinations are to be worked out. In the long term, metals can be and will have to be replaced by timber in construction and cultivation of timber become important. Raw materials for most of the current petroleum based chemicals can be and will have to be obtained from wood. Mining shall not be included in the primary sector. Its quanta will have to come down drastically. Secondary producers like animals, fish, poultry, diary etc. can be dealt with separately.

4.5 A farmer with on ha of own land can manage it singly ie. with say 250-300 persons days of labour input. The net income excluding cash input items per hectar varies from Rs. 30,000 (for paddy) to Rs.100,000 (rubber). This is for about 1800 hours of own labour. Income per hour, for the labour of one hour in own land, comes to Rs. 20 to Rs. 50. Ordinary labour in construction works gets Rs. 60-80 per hour. Why should one be a peasant? Is it not better to be a labourer then a peasant? A teacher gets Rs.150 per hour, a professor Rs. 500 per hour. Why should anybody cultivate? Be a farmer? The price of agriculture products are forcefully depressed – a legacy of the birth of industrial capitalism.

4.6 Unsustainability of high input agriculture – dependence on coal and oil – treasure house of accumulation of photosynthetic solar energy – finite and limited quantities – nutrient recycling – rupture in soil metabolism through urbanization. All animal and human excreta have to go back to the oil. Sun dictates only the carbon cycle N, P, K etc. cycle is to be maintained by humans engaged in agriculture. Need to re-envisioning agriculture – writings Marx and Engels on agriculture Von Liebig's writings on soil chemistry.

4.7 Declining share of agriculture in GDP world over – historical trend of conversion of forest

land to agricultural land to commercial land. Further, shift from food culture to cash crop culture – experience of Brazil and other Latin American countries – preponderance of maize in USA – to feed animal for meat industry – rape of Africa – what is happening in India. Trend of area under non food crops – utilization of crop lands – the question of ownership of land.

4.8 Land reforms in India, through decades – Kerala compared with rest of India – land ownership pattern – legal and real – waste lands – wasted labour power – an unpardonable situation – A new wave of more genuine land reforms.

4.9 Awareness about the negative reaction of over chemicalized agriculture – as symbolized by Khrushchev's slogan: Communism – Electrification of the country + chemicalization of agriculture – the new understanding – organic agriculture – what to day is akin to fundamentalism may by 2030 or 2040's become the normal mode – Total organic recycling – scientific use of water – precision farming – prospects.

4.10 Possibilities of ploughing back municipal waste, agro waste and all biodegradables back to the soil – various forms of composting and biomethination – capture, both solar energy and food elements like NPK – possibility of a nation wide campaign to convert every so called "waste" into wealth.

4.11 Organic farming is not a religious concept. In spite of short term benefits, the long term drawbacks of chemical farming was known to Justus Von Liebig and other soil chemists almost 200 years ago! In the not so long term petroleum based chemical fertilizers are going to become rare and too costly. There is no escape from fully recycling soil nutrients. 'Organic farming' is the name given for this process. Organic fertilizer improves soil texture and efficiency of water utilization.

4.12 Precision farming is the name given to strict control of inputs based on 'knowledge', so as to yield larger outputs for given inputs. Drip irrigation is the simplest in this. Fertigation is an improvement. Pest and disease prevention through proper management of weeds - temperature and humidity control can be more effective inside glass or poly houses. Innovative techniques to bring down costs of poly houses have to be adopted.

4.13 Regional self sufficiency and security in food availability should be aimed at. One can conceive that a given area, say a watershed or a group of panchayats to become increasingly self sufficient in food – calories, proteins, fats, vitamins and minerals; in daily consumption goods like cleaning agents, beverages, energy, education, health care etc. The aim could be (a) to reduce work related travel (b) to reduce transportation of goods except rare materials and products (c) to keep intact the family - nuclear or even extended.

4.14 Initiate a major all round programe to plough back, all animal excreta, including human excreta as well as agriculture waste, municipal waste etc. into the soil. Also extract, as far as possible, the photosynthetic energy stored in organic waste, through bacterial methination.

4.15 Urban rich and rural rich waste a lot of water and fertilizers for garden and lawn because they can afford to do so. The same effort and materials can be used to produces vegetables and other food items. Vegetable gardens also can be made beautiful to look at. Further, we waste a lot of solar energy that fall on our roof top. We have taken away the land available for cultivation for building construction. This is becoming increasingly a crime towards humanity. This crime can be atoned by using our roofs, especially terraces, for vegetable cultivation. Only little soil is required. Water too can be controlled.

4.16 Cereals are less resistant to climate vagaries than trees and tubers. The cereal production, especially in countries like India, is expected to go down substantially due to climate changes. In order to ensure food security it is desirable to get rehabilitated to the original food of the species, namely fruit, root and meat. A massive plantation programme for fruit bearing trees has to be initiated - jackfruit, bread fruit etc. are excellent examples. They also yield timber fodder and fuel - help sequester carbon from the atmosphere and fix them as structural components.

5. ANIMAL HUSBANDRY

5.1 Strengths and weaknesses of government programs in animal husbandry – citizen's view.

5.2 Traditional system – desi varieties – open grazing – zero cost feed – low productivity of milk and meat – source of cow dung.

5.3 Modern animal husbandry – factory model farms – total economy of large scale farm – cattle – goat – pig – poultry.

5.4 Rural animal husbandry – back yard poultry - cattle shed, pigsty, goat cage etc. economy and health.

5.5 Small scale modern farms with shared services of veterinary doctors, feed producers and consumers – division of the rupee paid by the ultimate consumer – a federal way of organizing the unorganized sector in animal husbandry.

5.6 Local breeds with very special qualities – high conversion efficiency, easy management, high resistance to diseases, special qualities of milk and meat and so on – what we have lost already – what survives – how we can ensure their long term survival.

5.7 Livestock and land – historical experiences world over and India – Impact of anti-cow slaughter attitude – over population – parallel to monkeys, peacock etc.

5.8 Special status of pig, poultry (backyard) and fish as converters of waste directly into human food – possibility of medium scale, scientific piggeries.

5.9 Scope of large number of household goateries both for diary and meat – self sufficiency of milk (250 ml/day) in rural, poor, household.

6. FISHERY

6.1 India's coastline and marine wealth – Annual fish catch – outline – economic zone.

6.2 Coastal states WB, Orissa, Andhra, Tamil Nadu, Kerala, Karnataka, Maharashtra and Gujarat – Fish landings – historical trend – potential

6.3 Economic zone – deep sea harvesting – coastal fishing – potential mechanized vessels – small and large.

6.4 Coastal Zone: traditional and industrial fishing – conflicts – over exploitation and depletion – fishing communities – tensions – various organizations.

6.5 Pisciculture – back waters – brackish waters – fresh water – domestic – industrial – conversion of paddy fields – soil and water pollution.

6.6 From net to table – the fish routes – intermediaries – traditional and modern – cold chain transportation – trade, national and international.

6.7 Fishing gear – simple to complex – net, boat, landing platform, harbours, repair shops - Catamaran to factory-ships.

6.8 Cold storages – preserving – processing and packaging – fish waste.

6.9 Life of fishing communities – crowded settlement – ill health - illiteracy-drunkenness - quarrels – intervention of church, religious organization and NGO's.

7. FOOD SECURITY

7.1 Area levels – household/village/district/region/nation/global

7.2 Food variety: narrow spectrum – broad spectrum-rigid-flexible-normal-processed

7.3 Balanced diet – different categories of people – carbohydrate – protein-vitamin-fats-minerals-calories

7.4 Human food – pre and post agriculture – fruits – tubes – meat – plus later cereals

7.5 Present Indian consumption pattern – average for India – extremes – different regions of India.

7.6 Cereals – national level – state level – regional level – household level.

7.7 Tubers – pulses – fruits – vegetable per capita production – per capita consumption – different layers of the society.

7.8. Meat, beef, pork, fish, eggs, milk

7.9 Availability and purchasing power – population growth, entitlements – assurance of minimum income – public distribution system.

PART III

8. LAND USE AND FORESTRY

8.1 Land area of India – states – revenue land – forest land – functional forests and notional or administrative forests – waste land, wasted land and fallow lands.

8.2 Natural forests and revenue land - tree cover - function of forests – biomass – bio-reserve – gene pool – hydrology – timber – NTFP

8.3 Change in forest area – historic – global - Indian – states – changes during past century - implications and impacts.

8.4 Demand on forest land – mining, agriculture, roads and railways, hydroelectric projects – tourism

8.5 Contradiction – forest dwellers – tribals – mineral wealth below – the argument that if nobody utilizes a resource, then it is public property – the principle of eminent domain – justification for the eviction of tribals from their ancestral lands.

8.6 Who are the *owners* of the forest? The tribals who live there? What is the nature of their ownership rights? what are the rights of plains people on forests?

8.7 The question who owns revenue land? What is the nature of ownership? Who owns the minerals below, the water below, the air above, the space above? Limitation of ownership.

8.8 Timber is, basically a renewable resource if annual harvest is equal to or less than animal growth. The standing biomass, especially of hard timber, can be increased.

8.9 Erratic climate due to global warming makes reversion back to a fruit predominant diet from cereal diet will release substantial area of land to be converted back from cereal fields to food yielding timber forest.

8.10 At 2-3% growth/harvest rate, substantial quantities of hard timber can be extracted from natural forests and cultivated woods. The carbon in this can be fixed for long term as parts of buildings. This is the most efficient method for carbon sequestration from the atmosphere.

8.11 India has vast areas of waste land and semi and barren but cultivable land, we can conceive a massive food forestry programme with species like jack, bread fruit, mango, jamun, palm et. Species selected appropriately. This will yield food for human, fodder for animals, fuel and timber.

8.12 Forestry should be made people centric – they can nurture forests, as different from agriculture and also reap dividends. Joint Forest Management and Forest Rights Acts of 2006 – experience so far.

8.13 A grand vision of afforestation – literally green India – yielding timber, raw material for chemical industry, food and fuel, and carbon sequestration.

9. WATER RESOURCES

9.1 Gross survey of resources: Ground water, surface water and glaciers – precipitation – spatial – temporal distribution –

9.2 Safe drinking water – large dam and piped supply – small community supply – own source – caste prejudices - purification of water at home. Control on drinking water should be as near as

possible to the citizens. Advantages of local personal piped water supply – conflicts and costs arising out of long distance transportation of water.

9.3 Storage of monsoon water – large and a medium dams – experience of large scale flood irrigation – Punjab, Tawa (Madhya Pradesh) and elsewhere – water logging – power generation

9.4 Water demand – rural /urban, domestic/agriculture/ industry.

9.5 Water pollution – domestic – industrial – agricultural – cultural – grey and black waters.

9.6 Navigation – floods – salinity control.

9.7 Global warming – climate change – unpredictable weather changes – inundation of coastal plains – shrinking of glaciers - Himalayan summer flow in Ganges/Brahmaputra - The threat to the great river system of India.

9.8 The technical absurdity of linking rivers – interbasin water transfer a political idiocy – existing interstate water disputes – Tamil Nadu/ Karnataka/ Kerala/ Andhra(?)

9.9 Water requirements – spatial water demand calendar – water availability calendar – mismatch – efforts to match in one area deepens mismatch in another area – river basin based re-calendaring.

9.10 Availability of fresh water is decreasing and will continue to do so – especially with global warming. The great iceberg/glacier storages are shrinking – necessity of increasing water use efficiency at all levels – domestic, agriculture and industry.

9.11 Water budgeting and water balances micro-macro watersheds, river basin, regions – water use planning – water policy – national and state.

10. ENERGY

10.1 Centrality of energy in societal progress – increasing consumption of energy – from hunting - gathering times to present day.

10.2 Energy – GDP-HDI-life expectation relationship – energy gustling nations – energy deficient nations – energy efficient nations. Limits to energy requirements – GDP components – welfare goods/services, vanity goods/services and destructive goods/ services.

10.3 World energy scenario today – main sources – dwindling sources and increasing demands – Club of Rome report – unsustainability of Business As Usual model – Demand management – source change.

10.4 Indian situation – current energy demand – commercial and non commercial – domestic, industrial, agriculture, transport, commerce – sources – Integrated Energy Policy 2005 – demand growth – supply options.

10.5 Plus and minus of various options availability, environmental impact, cost, sustainability – coal, gas, hydro, nuclear, wind, biomass, others.

10.6 On the undesirability of nuclear option – not abundant, not cheap, not safe, not sustainable, unjust to future generations.

10.7 Advantages of solar power – inexhaustible – costs are coming down – clean – roof tops, road tops, reservoir – floating platform – can be fully decentralised – towards a massive solar programme – pumped storage systems.

10.8 Alternative development path – Gross National Happiness – Physical and Spiritual Quality of Life – need and greed – welfare, vanity and destructive values – strengthening local economy – reduction in travel and transport.

10.9 What can be done immediately? High efficiency cooking stoves – waste to energy to manure programme, Solar homes – solar schools – solar hospitals etc.

11. TRANSPORT

11.1 Noncongruence of natural resource distribution, processing plant distribution and use distribution – Transport of raw materials – transport of semi finished products, finished products.

11.2 Bulk transport at items: coal, iron ore, bauxite, ion and steel, cement, food grains, fertilizers, timber, sand, stone, bricks, tiles, marble. Total energy spent roads, vehicles, rail etc.

11.3 Conscious plan to reduce the bulk transport distance – especially when transportation becomes too costly – essential and non essential items – zonation for cement/fertilizer/food grain etc. Penalty tariffs for inter zonal transport – price control, quality control – Transport of marble from Rajasthan and even Italy – for the very rich – vulgar expenditure of rich.

11.4 Consumer goods transportation – increasing distance traveled by goods of our daily consumption – the concept of rupee – kilometers of consumption – produce locally, consume locally as far as possible.

11.5 Passenger transports the magnitude of the problem – urbanization – uneven distribution of economic activities – metropolitan traffic, city traffic – rural traffic – long distance traffic – restructuring employment politics.

11.6 Modes of travel – train, metro, cars, four wheelers, air, ship – energy cost per passenger kilometer - capital costs involved – railway, express way

11.7 The impending petroleum crunch – foolish in investing on express ways SUV's and luxury vehicles.

11.8 Redesign roads for safe walk ways and bicycle ways as in many European towns children to go to neighbourhood schools walking – good for exercise and for socialization – less time to reach schools – good exercise for accompanying father.

11.9 Development in real sense should mean (a) reduction in forced or necessary travel to work while making pleasure travels more enjoyable (b) continuous reduction in rupee kilometers or tonne kilometers of consumption through increase in consumption of local products and decrease in that of far away goods.

12. HOUSING

12.1 Defining a house or shelter – a shelter from changes in climate – spread to extreme climates – absence of natural protection – necessity of artificial protection – early humans – cave homes – first thatched houses – earliest civilization Jericho – houses in Jericho, Egypt, Mohan-je-Daro etc – concept of a modern home – separate functions – cooking area, living area, sleeping area, bathing and toilet area, store area, work area – multiple functions.

12.2 Requirement of a home – size for each function. Varying from 25 to 250 square meters and even more. How much is required? Should be clean – both from health and aesthetic considerations - it should be easily cleanable – floor, walls, roofs, doors and windows. Should be durable – how long? 30 years? 40 years? 400 years?

12.3 There should be sanitation, safe water should be available. The environment outside homes have to be clean – no cess pools, no garbage dumps, no breeding of mosquitoes, flies and rodents – importance of handling grey water, black water and solid wastes.

12.4 Housing situation in India. Number of people living in houses unfit for humans – the lower caste habitats and tolas in villages, the slums in town and cities – what is a house that is fit for humans? area, facilities, quality – Housing requirement of India – the gigantic nature of the problem.

12.5 Inequalities in housing – palatial buildings of the rich – wastages – some pictorial presentation. Real estate business – magnitude – taxing the rich – bursting cities.

12.6 Materials for construction – mining of natural resources – clay, bricks and tiles – white or china clay – marble, granite floors – terracotta – red or black oxide – shell – limestone mining – lime and cement.

12.7 Timber – present predicament - deforestation – massive afforestation with food growing, timber yielding trees – all timber homes – carbon sequestration and food security – indicative numbers for India - steel, paints, fittings etc.

12.8 Soil: A source of clay, sand and gravel raw materials – local soil as the source – further: selectively felled trees – composite materials – recycling.

12.9 Embedded energy in building, of various types – construction materials, such as brick, steel, cement, lime, tiles, fittings, paints etc. – carbon foot print – reduction – design features – Laury baker and other architects.

12.10 Green buildings – green towns - green rating – absolute and relative rating – the absurdities in current rating criteria. Negative carbon foot prints of timber, SPV, solar heater etc. – tax incentives for degree of greenness.

13. TRADITIONAL INDUSTRIES

13.1 Introduction – historical – ancient traditions – handloom – charka muslin – handicrafts – architecture etc. – de industrialization – what is to be done – modernization, increase productivity - minimum Rs. 300/day, Rs.6000 per month.

13.2 Agro processing industries – Jams, pickles, squashes, pappads, preserved fruits, flours, ready to eat materials, bakery items etc. – over all economic contribution – major items – scope of expansion – potato, tapioca, yams, banana, mango, apple, orange, pineapple, papaya, gooseberry – raw material problem – plantations – production – productivity. Staple food substitution – non traditional products – wastes converted into food.

13.3 Forest products collection – honey, medicinal plants, edible grain (bamboo), fruits, mahua, tendu leaves, various seeds, wild mango for pickles etc.

13.4 Traditional industries like:

13.4.1 Handloom and Khadi – dyes, quality, design – muslin – high value products for the rich and super rich – massive training and thinning of work force.

13.4.2 Jute, coir and other fibres – current status – economic, technical and production status – new products for day to day use – mechanization – reach the common man's market – R and D.

13.4.3 Pottery, ceramics, niche products – construction materials, utility products, decorative products – expanding market – ultimate medium term (10-15 years) potential export potential – Chinese pottery – pickling jars to replace plastic jars – massive storage of banana stems and yam stems in brine

13.4.4 Handicrafts, non electronic toys – wood – coconut shell – machinery – soft toys, bamboo, reed – utility products and studio products.

13.5 Research, development and technology inputs required – product design.

13.6 Aggressive marketing – local , regional and export – face to face marketing – high quality national level input – large scale substitution of the products of "sharks".

13.7 Overall modernization of all traditional products, keeping the small scale structure intact – strategy (i) improve quality, usefulness and efficiency (ii) patriotic and utilitarian marketing (iii) quality assurance (iv) vocational education specifically for those industries – local application of national capabilities.

14. MODERN INDUSTRIES

1.4 Introduction: consumer industries (department one) and capital industries (department two); industries producing welfare goods and those producing vanity goods conscious shift in industrial production structure - levels of self reliance and self sufficiency – private sector – public sector.

14.2 Basic heavy Industries

14.2.1 Steel making – rolling, forging – demand projection – iron ore reserves – export of iron ore – cumulative demand for steel iron ore up to 2050 – recycling – Is it wise to export iron ore?

14.2.2 Iron ore mining – deposits – problems of mining – forest, forest dwellers and biodiversity – Right to live for the tribals – right to 'develop' – for the 'civilized' – conflicts - justice.

14.2.3 Non ferrous metals – aluminum – copper, zinc, tin, manganese, nickel – demand up to 2050 – years of exhaustion – India – world – Alloys: Brass, bronze, others

14.2.4 Coal mining – coal demand for industries, for power – availability – problems of mining – coal bed methane.

14.2.5 Petroleum and natural gas – availability – locations – for how long – years of exhaustion – petroleum import.

14.3 Basic chemical industries – sulphuric acid, hydrochloric acid, nitric acid, chlorine, caustic soda – demand curves – what for

14.4 Petrochemical industries – fertilizer, plastics, paints, fine chemicals – carbon foot print of various products.

14.5. Household products – durable consumer goods, vanity goods and destructive goods

14.6 Relative contribution to GDP, of welfare, vanity and destructive goods.

14.7 Energy intensive industries – rethinking – substitution – import – reduction in demand.

14.8 Sustainability of industrial growth – Club of Rome Studies- industrial production and quality of life.

14.9 Education and industry – lack of resonance.

15. FRONTIER INDUSTRIES

15.1 Information technology – a very broad area – basically founded on computers, communication, information processing - applied in the fields of education, entertainment, administration, production control etc.

15.2 Hard ware for IT – chips – printed circuits – product design – container cabinets – materials.

15.3 Soft ware – the core of IT industry – the power of Microsoft – open sources – 'free' soft ware – extent of business – projection - relative value of foreign exchange drains – soft ware – hardware – brain export – soft ware Indian abroad

15.4 Concept of Smart Cities – back offices – farming out – purpose – who controls – possibility of Smart Villages – at least in Kerala – sustainability of software industry – IT related to finance market: stocks shares, banks, insurance etc.

15.5 Connectivity – microwave – equipments – role of Telecom Mission – satellite – optical fitters – universal connectivity – cell phones.

15.6 IT in road traffic – in rail traffic – unused potential – efficient track utilization.

15.7 IT in production sector – small scale – large – scale – automation

15.8 Bio technology – current understanding of the term – from gene manipulation to simple selection and grafting.

15.9 Biotech in health area – medicine – research – in agriculture – new crops – in materials – neo materials through genetic manipulation prospects in industrial production – production of alcohols.

15.10 Biomethination – large scale energy production using bacteria – developing bacteria of with desirable qualities – tapping solar energy in a different way.

PART V – SOCIAL SECTOR

16. EDUCATION

16.1 India still remains very very backward in education – compare with China, Brazil, Egypt, Indonesia, Pakistan etc. – constitutional obligation still not fulfilled – the RtE movement and Act – 8 years education – goal 12 years – Kerala is near it.

16.2 Quality in education – what is it and what for education? – does it fulfill? – attainment levels

– language, maths, science and humanities – what are RtE stipulations?

16.3 Question of relevance – common and local – flexibility – Indian economy and Indian education – 65 years.

16.4 Teacher quality and capability – critical role of teacher – deficiencies in training – lack of retraining – role of teachers as directors of future India.

16.5 Three aspects of education – knowledge, skills and values – what knowledge they gain – skills? – none; values – competition and selfishness – self destructive values.

16.6 Huts and palaces – inequality in physics infrastructure – a village school in, say MP or Orissa or Jharkhand and modern public schools – minimum requirements, which are not mean – resources required – what could have been achieved defense - budget, administration budget – Wastage Index.

16.7 The academic environment in schools – teachers – library, laboratory, cleanliness etc.

16.8 Poor attainment levels – years of education. Years of wastage – PROBE and other studies – illiteracy in schools

16.9 Provision for differential paces of learning – even non achievers with sufficient time – not more than 5% - additional assistance to teachers from among parents can achieve.

16.10 Special requirements for mentally and physically handicapped – physical, intellectual and emotional progress – whether special schools or common schools.

16.11 Highly talented people – advanced level courses - different subjects – guest teachers for higher level of learning – special schools?

16.12 Elite and common man's schools – importance of English language, computer competency and infrastructure – the issue of upgrading common schools.

16.13 Preschool child care – language learning – (spoken) skill learning, socialization – (emotional) learning - the do's and don'ts.

16.14 Literacy, adult education and life along education - equivalency programmes – need based skill development and academic programmes – short term and long term ones.

16.15 National Skill Development Mission – Polytechnic and I.T.Is – multi level training needs – hands on experience – learning hours – 2000-2200 per year NTTF courses – NSD Corporation.

16.16 Higher education – function: teaching, research and design, management, execution and production - irrelevance of general degree holders.

16.17 Universities – autonomy and autonomous colleges – affiliated colleges – university bodies like senate, syndicate, academic council, faculty etc., vice chancellor, teachers – administrative staff.

16.18 Democratic functioning – Teachers, non teachers and student's organization – rights, non rights and responsibilities.

16.19 Development perspective – required knowledge, skills and values – numbers – human power planning – medium term (10-12 years) and long term (20-25) years Korean experience.

17. HEALTH CARE

17.1 Health status of India – wide differences – cardinal indicators of health - IMR, ICMR, MMR, CDR, BR, Life expectation, malnutrition, morbidity etc. – general observation.

17.2 Detailed statistics – changes over time – unevenness analysis – morbidity, acute, chronic.

17.3 Health care: preventive care – food, water, environment, life style – inoculation/vaccination.

17.4 Curative Health Care – Hospitals – doctors – paramedical – instruments – medicines – health administration.

17.5 Medical colleges – government – private – quantity-quality – value-judgment – rural and urban – restrict admission to government colleges to rural poor – and guarantee them rural jobs – shift health concern to rural poor. Rural and urban rich will be served by private sector.

17.6 Quality of service – continuous self learning – patient / family friendly – duty time conscious

17.7 A people's drug movement - insists doctors to prescribe generic drugs – make it a punishable offense to prescribe brand drugs – revive the public sector – IDPL drug industry on responsible term – integrate small private sector companies in it.

17.8 Make national and state formularies - list out - essential drugs, useless drugs/tonics, harmful drugs – declare harmful drugs as such - punishment to those who prescribe it or sell it.

17.9 The commercialization of health care service – monitoring costs – instruments replacing doctor in diagnosis – costly tests – over prescription – collusion between doctors and med-reps.

17.10 The great rural - urban divide – conscious efforts to reduce the gap – education, electricity, roads, communication, housing.

17.11 NRHM, ASHA program – great potential – further inputs required – meaning of health for all – role of nutrition, clean, drinking water, clean environment, eradication of vectors – immunization

17.12 ICDS – universalization – quality improvement - supporting health care delivery system – mother/girl care – women care – training of ICDS workers – ASHA and ICDS coordination

17.13 Role of Ayurveda and other systems of treatment – potential of Ayurveda – theoretical and practical problems facing it – Thridosha concept to be translated into modern language problems of standardization, clinical trails - shortage of raw materials – education.

17.14 Tribal and single drug remedies – sidha – unani – other traditional system – homoeopathy

17.15 Health policy – favouring MNC's – the demise of IDPL.

17.16 Life style diseases – malnutrition and obesity – environment related diseases

18. SOCIAL SECURITY

18.1 True meaning of social security – the conviction that the society will look after self and family in case of emergency – the absence of the need to amass wealth as security insurance.

18.2 The concept of family – nuclear family, joint family – expanded family – increasing sense of security.

18.3 Different levels of security: food, housing, water, health care, employment, education, old age……

18.4 Different modes : own savings, family, local governments, state, federal – insurance - personal, group – sense of security – confidence level.

18.5 Right to Food, Right to Employment and Livelihood – Right to Education – Right to Information

18.6 Fear of insecurity – loss of human behaviour – erratic acts – danger to community – USA – African countries – Columbia etc. – Break down of civilization – degeneration into barbarism – possible extinction – lessons from animal kingdom and contemporary human history.

19. RESEARCH AND DEVELOPMENT

19.1 Role in education and in development – the story of Korea – case of conscious investment – historical evolution of research from ancient civilization – India's past – astronomy, mathematics, metallurgy, architecture and ayurveda –

19.2 Growth of R and D efforts in modern India 19th and 20th centuries – pre independence and post independence - leaders like Visweswarayya, Raman, Bose, Association for Cultivation of Science, Bhabha, Saha etc.

19.3 Major R and D streams: CSIR, DAE, ICAR, DRDO, ICMR, DST, DBT – their growth and contribution - universities

19.4 Contribution of Indian R and D to defense, energy, economy, human resource development – basic knowledge – problems plaguing India's research –

19.5 Indian researchers abroad – different environment – Chandrashekhar, Khorana, Ramakrishnan etc.

PART VI – DEMOCRACY AND PSM

20. THE GREATEST DEMOCRACY IN THE WORLD

20.1 65 years of 'democratic governments' – resistance to military governments – history of other countries – in 20th century.

20.2 What is democracy – the extent of people's power and control on their own lives – erosion over years – impact of globalization.

20.3 Theories on democracy: Earlier restricted democracies – universal suffrage – representative democracy and direct democracy – concentration of economic power – and of political power.

20.4 Power to the people – increasing control on own life – impact of individual decision on the larger community.

20.5 Multi tier democracy – strong central governments – who can become President of USA or PM in India?

20.6 The economics and politics of small society – importance of human scales in democracy – efficient use of natural resource – net work of associated producers (Marx) – Gandhian concept of self reliant village republics – oceanic circles – man-machine relationship – horizontal networking – production functional hierarchy as different from political and economic pyramids.

20.7 PPC in Kerala – it's success and failure – what was aimed at – democratic centralism and decentralized democracy

20.8 Equipping the citizens for democracy – curriculum for a citizen education for democracy – how to break down a gigantic problem into small ones, manageable by the people.

20.9 Capitalism, socialism and democracy – corporate economy and democracy – neoliberalism, globalization and neo imperialism.

20.10 Building up myriads of local resistance points – local economies – development concepts and democracy.

21. PEOPLE'S SCIENCE MOVEMENT AND DEMOCRACY

21.1 What is PSM – its origin – how different is it from popularization – international experience like Urania in Germany , Sfto in USA etc.

21.2 Science for Social Revolution: evolution of KSSP into a PSM – development of KSSP.

21.3 History of PSM in India – FILSA, AIPSN, BGVS – various activities – BJVJ and BGVJ.

21.4 Literacy Campaign – Ernakulam, Kerala, India, what it earned and where it failed.

21.5 PSM intervention in education – right to education, in health care (NRHM) in right to information, in right to livelihood (NREG), etc. – in energy, in water management – in environment.

21.6 Further possible interventions in energy, waste to wealth, education, democracy, resistance to global imperialism, decentralization, local economy etc. ❍