

Can Scientific Public Sphere be constructed? Science, Civil Society and Public Spheres in post-Colonial India

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Abstract: The ‘public sphere’ is one of the indispensable concepts of social theory produced in the global north. But do the ordinary Indians need this concept and how the Habermasian formulation of public sphere and rational communication could be applied in the non-Western contexts and more specifically, the Indian contexts? The paper digs into the literature on science communication and the debate initiated by subaltern scholars in relation to engagements in public sphere in non-western context. The concept of public sphere is used in this paper as a methodological category which enables to capture the dynamics of science-public coupling in Indian context. The paper examines the ‘scientific public sphere’ is not only a normative-theoretical project but also has empirical translation through people’s science movement (PSM) – Bharat Gyan Vigyan Samiti, Eklavya and Delhi Science Forum – in post-colonial India. Providing the points of convergence and divergence among these three PSM, the paper goes beyond a liberal Orientalist prescription to understanding such activities in the public sphere outside the West. It explains how scientists formed new (protest) organisations which democratised science and these new forms of socio-political action further led to science-based social movements in India as well as forging scientific public sphere.

Keywords: Science, Public Sphere, Social Movements, Post-Colonial, PSM, India.

Background

The concept of a ‘public’¹ with regard to science and technology (S&T) sometimes is based on two assumptions: the public is composed of individuals (rather than organisation or even networks of organisations) who form opinions about science and technology; and the individuals are holders of lay knowledge in the sense that they

lack the expertise of the particular S&T in question, even if they hold occupational and local knowledge which may be relevant to assessing or interacting with scientific and technological expertise. As expert knowledge has begun to predominate in policy-making and be influenced by corporate entities, social movements around the world have begun to contest and control scientific knowledge (Shiva, 1989; Parajuli, 1991; Rosenberg, 2000). At this backdrop, the present article offers an empirical account of the people’s science movement (PSM) in post-colonial India and seeks to address questions pertaining to the relationship between science and society and explore how a social movement forges and articulates this relationship through its processes. This research is located at the interface of sociology of science and the sociology of social movements. The relationship between science and society in India has been predominantly articulated through the concerns of the nation-state, its institutions, practices and policies. Studies of social movements articulating the relationship between science and society have been very few (Sahoo, 2010). Therefore, the present study attempts to fill this gap by examining the critical role of social movements in generating scholarly understandings of how the relationship between science, technology and society are shaped by social movements.

The study of the PSM in post-colonial India seeks to understand social movements through the lens of its participants, in the main, as they engage in the task of producing knowledge about issues which arise in their particular historical, political and cultural contexts. It has attempted to provide a situated understanding of the role of activists, which led to an appreciation of how the categories of science and development were inflected with particular meanings in specific contexts to articulate a different politics or a parallel discourse by the movement itself. In trying to demonstrate how the relationship between science and society is doing made and remade in specific contexts through various mediations by a social movement, show how science and society shape and constitute each other.

In fact, the scientific public sphere is constituted in post-colonial India through the science-based social movements² that makes it possible public criticism of science to a great extent, although

some scientific issues like inventions, discoveries and innovations are presented in the mode of popular science writing and media as well. The scientists/activists who were involved in these science-based social movements grappled with the classical question German Philosopher Max Weber (1917) posed in “Science as a Vocation”: “What is the value of science?” In more specific form, they asked what the proper relationship between science and society was and ought to be. This paper has used scientific public sphere as a conceptual category to explore the science-public engagement in the context of PSM where scientific public sphere can be defined as the public sphere in which deliberations on science occurs.

Constructing Scientific Public Sphere: A Theatrical Structure

The scientific public sphere is assumed to have a theatrical structure as suggested by Nancy Fraser (1995). For Fraser, it is an institutional arena of discursive relations, a theatre for what I call 3D’s: debating, deliberating and disparaging. The construction of the scientific public sphere as a theatrical model is helpful also in avoiding a theoretical predicament of the Habermasian conception of public sphere³. The idea that the scientific public sphere is structured like the modern theatre assumes that the backstage dynamics actually shapes and controls the deliberations on the front stage. The theatrical structure of the scientific public sphere with a front stage and a backstage consisting of different sets of actors enables us to situate discursive practices in their socio-institutional context.

The scientific public sphere has a front stage on which actors perform and a backstage where the stage managers are involved in a complex process of mobilising resources (e.g. financial, organisational and technical) for maintaining front stage. The backstage regulates although not exclusively, the performances on the front stage. The front stage and the back stage are two partially autonomous domains, however, dialectically co-existing. Each domain has its own unique structure and dynamics. Each sphere consists of a set of actors. The actors are those who perform on the front stage. An actor can be anybody who participates in the deliberation. Scientists, popular science writers, social activists and citizens, etc. usually appear as

actors. The general public constitutes an active audience for the scientific public sphere. The audience are so concerned about modern science that an audience profoundly cognizant of the role of science in regulating social worlds. This audience is the reference point of the deliberations in the scientific public sphere.

The Habermasian conception of the public sphere is ideally an ‘inter-subjectivity shared space’ reproduced through communicative rationality. Certain modes of communicative rationality are considered to be invalid by Habermas. I argue that the model fails to take seriously the aesthetic-affective modes of communication and hence certain groups’ voices. The aesthetic-affective mode of communication consists of multiple modes of everyday communication such as rhetoric, myth, metaphor, poetry, and ceremony. According to Dahlberg (2005) the aesthetic-affective mode of communication like greeting, rhetoric and story-telling can be integral to the communicative rationality and therefore decisive to the deliberations in the public sphere. Since certain communities and groups express themselves more through the aesthetic-affective modes of communication, the argument is that their voices cannot be bagged by the Habermasian model that intends to purge out such forms of communication as ‘irrational’.

The structure of the scientific public sphere is subject to transformations based on the changes and evolution in the discursive field at large. Its structure is also shaped by the deliberative process within. The structural transformation of the public sphere is contingent on the tension between these internal and external processes. It shows that the structure of the scientific public sphere is not rigid and fixed, but constantly evolving.

Moreover, while operationalising the public sphere as “some collection of public talk” is analytically relevant, and useful in many respects, it unfortunately excludes from analysis those who did not participate in the specific collection of public talk. This is not a small problem, as non-participation in Indian public life is pervasive, whether due to a decline in associational life, a general aversion to involvement in governance, or distaste for confrontational engagement or marginalisation of those who cannot afford the price of entry into this world and

those who prefer to remain outside it. Therefore, social movements are better described as “sites” or “spatial vortexes” of public formation in India. The present paper, as stated earlier, endeavours to understand the deliberative processes in and the discursive character of the scientific public sphere as well as its role in democratising modern science, by analysing three PSM cases. The paper looks at the role of PSM as comprising of actors engaged in ‘cognitive praxis’⁴, who play a significant role not only in the social shaping of knowledge, but also for the emergence of critical discourse⁵ of science in Indian society.

Data and Methods

Semi-structured interviews were conducted in three PSM organisations: Bharat Gyan Vigyan Samiti (BGVS), Eklavya, and Delhi Science Forum (DSF) with representatives of PSM organisations (n=55). Participants of these organisations assert their rights as citizens of democratic country to improve participation in policy-making. The three PSM organisations are only three of the many in which science has been central for contestation and mobilisation. To locate PSM participants to interview, I used a purposive sample of organisational representatives was followed by a snowball sample. Interviewees included movement leaders, such as presidents and secretaries of PSM organisations and grassroots level activists. The government representatives interviewed included were those directly involved with or related to PSM. Ethnographic observations of social movement activities, and meetings between PSM participants, experts, and other government representatives offered a basis for interpreting interview data. A wide range of written materials from government and non-government sources were also collected for purposes of reconstructing past events, including the development of PSM philosophies and activities. The interviews were transcribed, supplemented with extensive notes on documents on ethnographic observations and followed by data analysis. To comprehend the everyday practices of the PSM and its dynamics, the study essentially adopted a method of following the actors of the PSM, a method which had been adopted by Bruno Latour (1987) to study “science in action” in order to understand the culture of science and scientists (read activists here) within their workplace (scientific institutions) and in society.

Findings and Analysis

The Participatory Impulse from Bharat Gyan Vigyan Samiti, Eklavya and Delhi Science Forum

In order to empirically explore why the PSM-generated scientific public sphere arises and how it work, three cases have been discussed: Bharat Gyan Vigyan Samiti, Eklavya and DSF, in mobilising the public in S&T issues. While there are obvious internal and contextual differences between these three PSM organisations, they both exemplify similar characteristics of democratising science movement. In this sense, these cases are representative of broader, national phenomenon.

Bharat Gyan Vigyan Samiti (BGVS)

In 1987, the Kerala Shastra Sahitya Parishad (KSSP)⁶ organised a nation-wide Jatha⁷ called the Bharat Jan Vigyan Jatha (BJVJ). This Jatha covered a distance of 5000 kilometers and mobilised thousands of persons and converged at Bhopal, capital city of Madhya Pradesh state, from five different directions. It mobilised number of voluntary organisations along with individual actors based on the slogan of ‘Science for the People’. Since the form of literacy campaigns was rooted in the BJVJ programme of the 1980s, some of the important issues which remained invisible in the BJVJ programme. Though in the programmes of BJVJ, there was no space for engaging with concept such as ‘science’ or ‘the people’, the form of literacy campaigns generated interest and curiosity. The assumption that the prevailing high levels of illiteracy is a major impediment to the building of a PSM led to the adoption of literacy as a major agenda by the BJVJ. The 1987 Jatha was the seed of the concept of mass mobilisation for a cause, for instance, literacy. The model for this was provided by the KSSP which through the literacy campaign in Ernakulam district of Kerala in 1988 achieved ‘total literacy’. In 1988, the KSSP undertook a massive literacy campaign in the district of Ernakulam in collaboration with the district administration. KSSP made use of its time-tested medium kalajathas (cultural caravans)⁸ to reach out every nook and corner of the district to create an ambience for literacy programme. The district administration and KSSP, along with various other

voluntary and mass organisations worked hand in hand on the platform of now famous Zilla Saksharatha Samiti (District Literacy Committee)⁹. The campaign approach of Ernakulam proved to be a major success as there was a substantial response to literacy efforts. This was followed by campaigns in Kottayam district and later in the entire Kerala.

Field experience in Ernakulam, Kottayam and the Kerala state served to confirm the feasibility of campaign approach, so that it acquired selective legitimacy in scattered districts across the country (Saldanha, 1993). The challenges of moving from the already high-literacy-level districts of Kerala and other South Indian states to the more backward North Indian states were taken up with fervor (Saxena, 2007). However, it needs to be recognised that the literacy mobilisations within districts are primarily initiated by the middle class professional elites, aimed at the eradication of illiteracy and leaving the structures of oppression initially undisturbed.

In 1988, the government set up a National Literacy Mission Authority (NLMA) having indistinct strategy towards its implementation. In 1989, the NLMA decided to replicate the Ernakulam experiment at a national level with the idea of a broad-based experiment for propagating literacy. The basic principles of Ernakulam model and adopted by the NLM were: mobilisation using local cultural forms, motivating voluntary teachers to take up the task of teaching; and formation of people's structures from the district to the village levels to implement and monitor the programmes. The All India People's Science Network (AIPSN), at the request of the government, decided to form BGVS, with the primary responsibility of placing literacy on the national agenda. Malcolm S. Adiseshiah was its founder president and M. P. Parameswaran as secretary along with several leading scientists, technologists, educationists and social activists as its members. It was a crusade against illiteracy organised mainly by the PSM. BGVS acted as NLMA's search for a vehicle for mass mobilisation. To galvanize the literacy mission into a mass movement, literacy ambassadors were appointed in districts and state coordinating units were set up. The massive mobilisation effort, which covered 40,000 villages in around 250 districts of the country, sowed the seeds of what is popularly known as the Total Literacy Campaign (TLC).

For BGVS, the first step is a movement for literacy. The second step is widespread S&T literacy. This exactly is the reason why PSM have gone in a large way for mass literacy and science communication.

BGVS played an instrumental role in building up a common platform for various PSM organisations at national level since 1989 can be characterised by three phases (Sahoo, 2010). The first phase (1989-1993), a period of awakening was characterised by mobilisations for literacy. The second phase (1994-1997), a period of movement building was marked by a transition from literacy to developmental initiatives while establishing the interface between the literacy and development in the arenas of natural resource management, health, and public awareness. The third phase (1998-till date), is defined by the continuity of education centres and Gyan Vigyan Vidyalayas (i.e. centres of non-formal education and interface with formal schooling). The nation-wide mobilisation of BGVS has been reflected through the Bharat Gyan Vigyan Jatha (BGVJ) of 1990, Bharat Jan Gyan Vigyan Jatha (BJGVJ) of 1992, The Campaign for Hamara Desh of 1993-94, Samata Jathas (1992-93), Gyan Vigyan Vidyalaya Movement (2006-07), Jan Swasthya Abhiyan (JSA) of 2003, Jan Vachan Andolan (JVA) of 1994. the techniques of *jatha* and *padyatras*¹⁰ (foot march) employed by BGVS was significant for the democratisation of science and formation of 'public sphere' around S&T issues.

Eklavya

Eklavya, a PSM organisation attempted to challenge the orthodoxy of Indian [school] science education, was established in 1982, for teaching middle school science through experiments¹¹. The basic thrust of Eklavya lies in pedagogical innovation considering local context into account. Such innovations were first field tested at a micro-level in a few selected schools of Madhya Pradesh and later expanded to more schools and other regions of Madhya Pradesh. Along with text-books and work-books, kits and other teaching-learning materials are designed for children. With an attempt to structure the content around the environmental and social reality of the students, the activities rely heavily on use of local resources and considering factors such as cost reduction and procurability. For instance, Eklavya science

teachers identified *Babool ka Kanta* (thorn of babool) available locally in the regions of Madhya Pradesh as an instrument for puncturing and dissection and included it in a science kit they developed for biology students. They further developed an inexpensive way to explain the basic machines. This involved using spent ball-pen refills, flattened paper clips as “axles” and ordinary buttons sealed back to back under candle flame to provide multi-purpose wheels and pulleys.

The process of capacity building was used in the sphere of school science education by Eklavya through campaigns like ‘Joy of Learning’. This campaign exposed to around more than one million children and 35,000 school teachers across 250 districts of the country. Through educational experiments Eklavya created a scientific public based on the discovery or inquiry approach as compared to rote-learning (Ibid). R. N. Shyag, a leader of the Eklavya field centre at Dewas, observes that PSM is all about demystifying superstitions, religious orthodoxy, social evils, etc. As Vinod Raina of Eklavya, argues that the role of PSM is not only limited to communicating and simplifying science but also to question every aspect of S&T related activities, and intervening wherever necessary with people’s participation. According to Eklavya, S&T are not esoteric spheres of thought and action. They are to be approached with a concern for social equality and justice.

Delhi Science Forum (DSF)¹²

DSF was formed in 1978 as a network of scientists and engineers to mobilise the scientists and engineers on the issues of policy for S&T to democratise the practice of S&T in India¹³. The DSF began its own activities by talking of how the institutions of Nehruvian S&T efforts were failing to keep the goals of self-reliant and people oriented development alive, and that the path of development of S&T must be radically changed to achieve the goals of equity and self-reliance in India. The DSF took the lead in opening a trajectory of development of S&T where the objective was to prevent the repertoire of local knowledge and skills from becoming museum articles and upgrading the local capabilities, resources and markets to create technologies capable of delivering ecological and social justice in the areas of leather tanning, carcass recovery, fruits

and vegetable processing, agro-processing, non-edible oil processing, appropriate technology, pottery and agro-ecological to rural development (Sahoo, 2010). The members of DSF were basically scientists-as-activists. These actors employed various means of communication such as street plays, slide shows, exhibitions and workshops etc. The material produced for the communication addressed different target audiences, including policy-makers, activists, academics and general lay public. The major content of DSF’s material is nationally coordinated; the same gets transcribed and produced at state/regional levels in local languages. The strategies of DSF were for creating material(s) for campaigns on policies related to drug industry, health, the nuclear holocaust¹⁴ and the disaster like Bhopal gas leak.

Conclusion

PSM in India has possibly used public sphere in a counter-hegemonic way. The scientific public sphere generated by the PSM constituted a special kind of ‘scientific public[s]’ who participated in the deliberations at various levels. In the context of PSM, the scientific public[s] was mostly a political public¹⁵ who critically engaged with S&T¹⁶. Such public[s] comprised of people and networks of expertise including scientists, engineers, and doctors, teachers, and media professionals. Their expertise and resources were mobilised for different themes of deliberation. Their expertise may often be overlapping and mutually-contending. They were contributors to scientific public sphere. The relationship between these actors and PSM took two forms: for them science could be incidental to their involvement in a movement, or, most significantly, it could be the cause, the tool, the object and subject of activism. Though there are other scientific public spheres¹⁷ which facilitate alternative kinds of public engagement with S&T in India, but the scientific public[s] through PSM is a crucial presence.

The scientific public sphere through PSM offers us invaluable experience in the rethinking of the question of development through a critique of S&T. Though the BGVS, Eklavya and DSF claimed to be a non-political voluntary organisation, their objective was to raise consciousness of the people in order to harness the benefits of S&T

to socio-economic development. Scientists-as-activists were contributors to PSM in India through the organisations like BGVS, Eklavya and DSF. These three organisations provided a communicative space where public congregated to discuss shared concerns and potentially form collective judgements in S&T arena. These three PSM organizations created “multiple publics” in response to bourgeoisie public¹⁸ by Habermas. These multiple publics could be seen as the counter public[s] which has normative claims for their normative inclusion. The three case studies, however, offered different kinds of engagement with science. The character and behaviour of the scientific publics differed in each case study. In the case of BGVS, public sphere was constituted through the absence of [scientific] literacy and the desire/pressure to fill it as a resource that was mobilised. The second case revealed that the scientific publics were constituted through the agenda of science pedagogy. The third case, DSF took the role of a vanguard which presumes leadership due to the false consciousness of the public[s].

The landscape of public engagement with S&T is rapidly changing in contemporary India¹⁹. In such scenario, the old [social] movements fall short of understanding the public-science engagement, the new social movements are yet to recognize their role in formulating new ways of engagement with science in conformity with the new politics they propose. In this context, seemingly the PSM is the major site that offers a space for a different kind of public-science engagement, and hence the constitution of a PSM-generated scientific public sphere in India.

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Notes

1. The concept ‘public’ was first used by C. Wright Mills in *The Sociological Imagination*. Since then it has been elaborated in his many articles (the latest being Michale Burawoy, 2007). In this paper ‘public’ implies constitution of a group.
2. Science is featured as a subject, object and tool of social movements.
3. Habermas himself hints towards the possible existence of many public spheres in *The Structural Transformation of Public Sphere* (1989), but focuses on the political public sphere.
4. Cognitive praxis is operationalized in terms of knowledge interests, a translation of the knowledge constituting interests discussed by Jurgen Habermas in the 1960s.
5. The post-1970s also marked the development of science and technology studies (STS) as a significant discipline which offered a strong critique of modern science and technology (S&T). The streams such as feminist and postcolonial studies of science and the sociology of scientific knowledge opened up new sources of science criticism. The contribution of eco-feminism in developing a strong critique of modern S&T’s control and dominance over nature and women also was significant. These discourses had vital influence on the academic and political debates in India, shaping the public criticism of science. Further details, one can see Bandyopadhyay and Shiva, 1988; Raina, 1997; 2000 and Visvanathan and Parmer, 2002.
6. PSM organisations in India are rather diverse, with ideologies ranging from variants of Gandhism, to radical left (Sahoo, 2010). The most well-known of them is undoubtedly the KSSP, which is a massive organisation. Most of its human resources is composed of school teachers, and it has informal affiliation with the Communist Party of India [Marxist].
7. In *jatha*, there will be approximately twelve to fifteen amateur performers and elocutionists in two groups, selected from various districts on the basis of acting and speaking ability. They hold a camp to develop the ideas to be presented, the scripts, the roles, and to learn their parts. The puppet plays, short plays and songs they develop would constantly be revised on the basis of group and self-criticism.
8. The very idea of *Kalajatha* began to evolve in KSSP in 1977 while conducting a science cultural caravan. The first *Kalajatha* was launched in 1981 and still the PSMs in India consider it as an effective method to reach common masses (Narayan, 1999). It consisted of displays of posters, banners, hoardings, stickers; *padyatras* (marching on foot), street theatres and songs.

9. At the district level, an autonomous organization called the *Zilla Saksharta Samiti* (District Literacy Committees) is registered to provide a forum for individuals and organizations to work together. This Samiti often constitutes a mix of government officials, elected political leaders, NGOs, representatives of mass organizations, including women's organizations. In most districts, the Collector/District Magistrate becomes the chairperson of the ZSS as he/she is then able to galvanize the support of different development departments in the implementation of the total literacy campaign.
10. The technique of *padyatra* can be traced back to M. K. Gandhi as it involves non-violent actions. The non-violent actions have been a conscious choice by BGVS both as a strategy and as a principle.
11. A fallout of the Hoshangabad Science Teaching Programme (HSTP) was the establishment of Eklavya. The HSTP started in 1972 as a pilot project in 16 schools of Hoshangabad district of Madhya Pradesh in India. At the time of its abrupt closure in 2002, it was running in around 1000 schools in 16 districts of Madhya Pradesh. The HSTP was unique in that it was a State programme, running in State schools, supported by a large academic resource community. Although no longer a running programme, the HSTP influenced the alternative discourse on education in the country (Sahoo, 2010).
12. To undertake a research study on Delhi Science Forum within the limited time and available resources was an extremely difficult task. There was a strong temptation for the author to base the research on the available literature, which in fact, rich and extensive. As the Forum lacks a formal structure and documentation, I was primarily dependent on Prabir Purkayastha, one of the Vice-Presidents of DSF, for articulating the concerns and perspective of DSF. However, the larger part of this research was based on interviews and field experiences.
13. In his unjustly neglected book, *Chain Reaction: Expert Debate and Public Participation in American Nuclear Power, 1945-1975*, Brian Balogh (1991) presented a model that accounted for how and why expert debate moved from a place behind closed doors to become performance in public forums. Furthermore, the dynamic Balogh provides a clue as to why a diversity of experts was generated and was visible in the period that interests us.
14. DSF offered the 'most serious resistance to use of the Nuclear Bomb', but their critique was of use (and abuse) rather than of the science (Sahoo, 2010). Nevertheless, there were seeds of a critique of use-abuse instrumentalism. While science was seen by some as a neutral tool that was being abused rather than well used, for DSF nuclear science was a tool it would rather did not exist in the world.
15. They are conscious of the increased role and diverse manifestations of modern S&T in everyday life.
16. According to Leach, Scoones and Wynne (2005), the mainstream approaches to the question of citizen's engagement with S&T revolve around a definition of citizenship rooted in the liberal political theory. Here the "citizens are either expected to engage passively with expert scientific institutions". The authors contrast this image of citizenship (that is more in conformity with the deficit model of Public Understanding of Science) with "a model of the citizen as a more autonomous creator and bearer on Knowledge[s] located in particular practices, subjectivities and identities, who engages in more active ways with the political institutions of science...who do not act solely as individuals, as in liberal political theory, but through emergent, and sometimes global, social solidarities that may unite people around particular issues and visions, whether these be fluid and shifting with circumstances, more lasting (ibid: 12). The concept of 'ethno epistemic assemblages' suggested by Irwin and Michael (2003) goes beyond even this definition of citizenship, while focusing more on the formation of rhizome like interconnections which mix-up different things.
17. Literary and political magazines in different Indian languages publish popular science articles, which often introduce new developments in contemporary science. There are also science clubs at schools and S&T museums run by the state government which function as scientific public spheres.
18. The concept of public sphere reflects, in a stylized way, the political parties of the European bourgeoisie at the beginning of the eighteenth century. It expresses the emergence of the bourgeois citizen as a political actor through practices and institutions (coffee houses, salons, newspapers, clubs, etc.) which mediates between the private sphere of civil society (family and the economy) and state political authority.
19. New conflicts started emerging in association with techno-sciences like information technology, biotechnology and nanotechnology. The advent of globalisation and the regime of economic liberalisation altered the role of S&T. The study of 'risk' did arise in this context as the techno-sciences come with increased public distrust.

References

- Bandyopadhyay, J. and Shiva, V. (1988). 'Political Economy of Ecology Movements' *Economic and Political Weekly*, 23(24): 1223-1232.

- Balogh, B. (1991). *Chain Reaction: Expert Debate and Public Participation in American Nuclear Power, 1945-1975*. Cambridge, UK: Cambridge University Press.
- Burawoy, M. (2007) 'For public sociology'. In *Public Sociology*, Clawson, D., Zussman, R., Misra, J., Gerstel, N., Stokes, R., Anderton, D. L. and Burawoy, M. (Eds.), pp.23–66. Berkeley: University of California Press.
- Dahlberg, L. (2005). 'The Habermasian Public Sphere: Taking Differences Seriously?' *Theory and Society*, 34: 111-136.
- Fraser, N. (1995). Politics, Culture, and the Public Sphere: Toward a Post-Modern Conception. In Nicholson I. J. and Seidman S. (Eds.), *Social Postmodernisms: Beyond Identity Politics*. Cambridge, UK: Cambridge University Press.
- Habermas, J. (1989). *The Structural Transformation of the Public Sphere*. Cambridge, MA: The MIT Press.
- Irwin, A. and Michael, M. (2003). *Science, Social Theory and Public Knowledge*. UK: Open University Press.
- Latour, B. (1987). *Science in Action: How to Follow Scientists and Engineers through Society*, USA: Harvard University Press.
- Leach, M. Scoones, I. and Wynne, B. (Eds.). (2005). *Science and Citizens: Globalization and the Challenge of Engagement*. London, UK: Zed Books.
- Narayan, E. K. (1999). Communication Methods of Kerala Sastra Sahitya Parishad. In B. Bell et al. (Eds.), *Communication Processes, Media and Social Change*. www.ias.nl Accessed on March 18, 2018
- Parajuli, P. 1991. 'Power and Knowledge in Development Discourse: New Social Movements and the State in India' *International Social Science Journal*, 127: 173-190.
- Raina, D. (1997). 'Evolving Perspectives on Science and History: A Chronicle of Modern India's Scientific Enchantment and Disenchantment (1850-1980)' *Social Epistemology*, 11(1): 3-24.
- . (2000). The Present in the Past: Trajectories for the Social History of Science. In Thapar, R. (Ed.), *India: Another Millennium?* (pp. 17-35). New Delhi, India: Viking Publications.
- Rosenberg, D. G. 2000. Toward Indigenous Wholeness: Feminist Praxis in Transformative Learning on Health and the Environment. In Sefa, G. J., Hall, D. B. and Rosenberg, D. G. (Eds.), *Indigenous Knowledge in Global Contexts* (pp. 137-155). Toronto, Canada: University of Toronto Press.

- Sahoo, S. (2010). Mobilizing People for Science: Empirical Studies of People's Science Movements in Late XXth Century of India. Unpublished PhD Dissertation, Indian Institute of Technology, Kanpur.
- Saldanha, D. (1993). 'Cultural Communication in Literacy Campaigns: Social Relational Contexts, Processes and Hegemonic Organisation' *Economic and Political Weekly*, 28 (20): 981-989.
- Saxena, S. (2007). Education of the Masses in India? A Critical Enquiry. In Kumar, K. and Oesterheld, J. (Ed.). *Education and Social Change in South Asia* (pp. 408-441). New Delhi, India: Orient Longman.
- Shiva, V. (1989). *Staying Alive: Women, Ecology and Survival in India*. London, UK: Zed Books.
- Visvanathan, S. and Parmer, C. (2002). 'A Biotechnology Story: Notes from India' *Economic and Political Weekly*, July 6: 2714-2724.
- Weber M (1958 [1917]) Science as a vocation. In Gerth, H. H. and Mills C. W. (Eds.). *From Max Weber: Essays in Sociology* (pp. 129-156). New York: Oxford University Press.

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