Editorial Introduction to the Special Issue: Inquiring into Technoscience in India

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DIALOGUE
Science, Scientists, and Society

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The relationship between science and the public is indeed a complicated one, and it gets messier for it is equally contingent upon how we happen to think about this relationship. We certainly don't wish to commit the fallacy of believing that the way things are is identical with the way we think about them. In any case, scholarship on science and society over the last century and a half has gone a long way in establishing not just how complicated and nuanced this relationship is but how it changes even as we move from the era of big science to mega science. But while the early half of the century has been earmarked as the era of the scientisation of society, over the last couple of decades the structural differentiation within the world of the technosciences has produced a diverse science-society ecosystem that has resulted in a perceptible socialisation of the sciences themselves [Nowotny et al. 2001].

The fundamental asymmetry characterizing the science-society relationship is that scientists often make society the laboratory of their experiments, while not turning that investigative gaze upon science itself. In an interesting rhetorical flourish, Steve Fuller suggests that there has been a transformation of the radical agenda of science of the seventeenth and eighteenth centuries into a relatively orthodox agenda that crystallized by the end of the twentieth century. In the eighteenth century, the organization of knowledge production outpaced the modern organization of society. This uneven development was reflected in the rate at which the experimental method democratised science as compared to the democratization of society as a whole. This relationship has possibly been reversed, with science lagging behind the democratising tendencies manifest in the rest of society [Fuller 2000].

Furthermore, if we were to consider the hallmark of industrial society to be the intensification of the division of labour, knowledge societies could be characterized by the fragmentation of the traditional constellations of knowledge. This fragmentation could produce a variety of consequences. For one the currently prevalent calculative rationality of the knowledge enterprise could arrive at the conclusion that the rate of return on investment on knowledge production has become small enough to merit closing down shop [Horgan 1997]. These developments naturally impinge upon the functioning of the traditional sites for the production of knowledge such as the university and the research institutes.

The papers appearing in this special issue of *Dialogue* were initially presented at a Workshop organized by Govind Gopakumar of Concordia University and N.C. Narayanan of IIT Mumbai, entitled *Interrogating the Emerging Technoscientific Consensus: Intersections between Citizen Science, STS & Innovation Studies* held at IIT Mumbai on 4th December 2018 and to them goes the credit for organizing this issue. The papers themselves, it could be suggested, seek to widen the base of knowledge production by incorporating heterogeneous actors into a narrative that till recently rendered invisible all those who were not linked to the technoscientific world of the laboratory or the research institute or the university and thus lacked expert credentials. STS's salient contribution to the understanding of the relationship between science and society was to underscore the distributed nature of expertise and scientific labour. Social movements too are globally becoming important players in the knowledge generation enterprise. Consequently, the transformation of the culture of science and technology on the one hand and industrial production on the other has over the last three decades of the twentieth century compelled STS to reinvent itself. However, this does not entail a preoccupation merely with the economic dimension of technoscience, the bug bear of agendas steered by international capital, or the crescendo of market innovation as the primary motor of innovation.

The concern with the politics of technology as Langdon Winner had alerted us to more than half a century ago has been an important concern of critical STS [Winner 1977; Winner 1992]. The readers of this journal may wonder what is meant by the 'politics of technology'. McInerney suggests that we consider Politics with a capital P, as some scholars have done to connote the realm of what one might call macropolitics (*P*olitics) that would include the entire range of activities associated with the governance of entire societies, social groups, nations and communities. On the other hand, there is also the politics of the every day with a small P, or micropolitics (*p*olitics), that pertains to the relations and interests between and among individual actors. It is possible to see on the one hand why Winner claims certain technologies, such as nuclear weapons, are inherently *P*olitical, while others, such as bridge designs embody a reified version of *p*olitics of their designers [McInerney 2009: p. 207; Winner 1986]. There is a tendency to reduce the former to the latter, 'contending that all technologies contain the interests of actors' [Ibid.]. This in part is a product of a category mistake arising from the recognition of our dependence on the structure and functioning of large scale complex systems and powerful technologies operating at the level of .nations These complex socio-technical systems are themselves shaped by systems for the production of knowledge that are governed, while simultaneously being technologies of governmentality.

If on the one hand, STS researchers study the expanding dominion of science by mapping the participation of heterogeneous actors at several levels, clearly, this activity is also pursued outside the standard institutional sites of science such as the laboratory, or observatories of various kinds. In other words, it extends to a multitude of sites of so-called knowledge production. The site is just not a dedicated location but as much reflects the movement to go beyond the '…heartlands of the political West and global North' [Garforth and Stöckelová 2012 p. 226]. Two issues need to be identified here. Namely, the need to develop a frame for studying

technoscience or sociotechnical systems within the global South, given the heterogeneity of political and knowledge systems and associated practices; and on the other hand to maintain a critical posture to policies and policy frameworks as well as to provide insights into the policymaking process itself [Ibid., p. 228]. Perusing the papers appearing in this volume, it is evident that a number of scholars working on the global south are not just cognizant of the issues concerned but are grappling with developing such frameworks. It may indeed be worthwhile in two or three years to review the progress made in this direction.

As far back as 2001 Wiebe Bijker at the Annual Meeting of the Society for Social Studies of Science (4S) called upon STS researchers to actively work toward "democratizing technological culture" [Bijker 2003: p. 444]. Bijker felt that science and technology studies (STS) scholars could and should make important contributions to democracy because all of contemporary culture is shaped by science and technology, including those dimensions of culture that are not explicitly coded as scientific and technical. Science and technology pose particular challenges for participatory democracy [Stevens 2008]. Similarly, Leach and Scoones advocate "cognitive justice" through "engaged citizenship" in support of particular political goals, solidarity building, and "cognitive representation" [Leach and Scoones 2005: p. 37; Visvanathan 2005]. Latour stressed the role of STS scholars in building opportunities for public agency by identifying (and helping to construct) "matters of concern." As he put it ever so eloquently: "The critic is not the one who debunks, but the one who assembles. The critic is not the one who lifts the rugs from under the feet of the naïve believers, but the one who offers the participants arenas in which to gather. The critic is not the one who alternates haphazardly between antifetishism and positivism like the drunk iconoclast drawn by Goya, but the one for whom, if something is constructed, then it means it is fragile and thus in great need of care and caution. I am aware that to get at the heart of this argument one would have to renew also what it means to be a constructivist…" [Latour 2004: p. 246].

These issues are not new and were reflected in an important discussion in 2002, having to do with the so-called the `Third Wave of Science Studies.' The discussion erupted from the realisation that SSK had problematised the exhortation 'Trust scientists because they have special access to the truth'. Years of detailed studies on scientific controversies had led to many posing the question namely: ''If it is no longer clear that scientists and technologists have special access to the truth, why should their advice be specially valued?" This as Collins and Evans pointed out deepens the intellectual problem of the age; shifting the focus of investigation from the epistemology of scientific knowledge or the question of truth to one of expertise [Collins and Evans 2002: p. 236].

In what Collins and Evans call the first wave of science studies extending from the 1950s deep into the 1960s, before 'the expertise problem' raised its head, the general concern of science of science was to understand and explain the success of the sciences, and not challenge its conclusions or foundations. It was assumed by the publics of science as well as researchers that a good scientific training conferred on scientists an authority and decisiveness about their field and neighbouring ones [Ibid., p. 239]. The second wave commencing in the early 1970s is referred to as 'social constructivism', its variants being EPOR, SSK etc. In this phase interest

focused on of the making of the expert and the manner in which this legitimated expertise travelled between institutions. The sociological attempt to construct science as just any vocation and on the lines of any other form of human activity blurred the relative autonomy of science and created uncertainty about what differentiated it from other realms of human activity. Collins and Evans add that this blurring has produced another one where it became difficult to distinguish between experts and non-experts. [Ibid., p.239]. Returning to an older agenda, Collins requires that sociologists of knowledge must devise categories `to do with knowledge', further that they develop a 'knowledge science' using knowledge and expertise as *analysts'* categories [Ibid., p. 240]. Thus, the Third Wave of Science Studies prescribed a greater emphasis on the role of expertise not just as an analyst category but as an actor category. Collins and Evans proposed two kinds of expertise to achieve these ends namely 'interactional expertise' and 'contributory expertise.' These could be deployed to describe both the activities of the sociologist as well as the scientific actors being studied [Ibid., see discussion p. 240-254]. There has been a great deal of debate on this paper with many recognizing the importance of the interactional expertise of the analysts more than their contributory expertise.

Finally, returning to the question of expertise recent discussions have begun to recognise the expertise that is distributed rather than cordoned off within the sphere of specialist scientific institutions and laboratories. The emergence of these locations is manifest as increased public deliberation and citizen participation in decision making related to public issues and controversies where science and technology are involved[1]. The regulation of the social world demands more responsibility from the citizen and hence the need to gather information from and consultation of diverse sources of expertise thereby pushing the notion of expertise beyond the realm of institutionalised science. While the new mode of knowledge production has been much debated, the crisis for the stakeholders and governments in the debate is a reflection of how contradictory voices could produce a wider democratic consensus leading to a better and inclusive menu of policy options.

The papers appearing in this issue do not address issues of all the sciences and their intertwining, impact and the reshaping of science and related policy; but more specifically with what in an older vocabulary was labeled public interest science, but today goes by many labels approached under the rubrics of contextualist public understanding of science, new social movements, citizen science, mode-2 knowledge production, post-academic science [Ziman 2000]. Each of these is associated with a set of questions and a family of concerns, but what they all share in common is a wider horizon of the sites of knowledge production and a heterogeneous network of actors. On the whole, it could be argued that the term postnormal science (PNS) does some justice in capturing this range of activities. In the wake of the second wave, it appears that all the assumptions and the standard picture of science stand challenged. This explains the "post-normal" but where PNS departs is that while acknowledging this

[1] For a detailed discussion see Varughese's paper in Dialogue [Varughese 2020].

challenge it does not abandon science but continues to engage with "science and society" constructively [Funtowicz and Ravetz 1993].

The papers here are concerned with the intersection and interface of not just the technosciences in the making but the policymaking process. A process in which in addition to scientists, a heterogeneous citizenry (that includes not just beneficiaries but more likely affected and impoverished constituencies) participate either as stakeholders, clients, partners but also as possessor's of an acquired expertise which is different from the authoritative perspective of the expert scientist. As an analytic category PNS offers the possibility of circumventing the imbroglios associated with the diverse forms of expertise as well as the involvement of non-specialist citizens, journalists and campaigners and wider social movements, all of which coalesce in the making of resilient policy and ensuring democratic citizenship - full closure is never achieved on any of these matters [Ibid.]. It stands to reason that old concepts come back in new forms and what we consider to be new conceptual frames disguise the signature of ways of addressing older problematics.

Thus while the underlying premise shared by the papers published here is that in enlarging the scope of citizen participation in the sciences it is possible to develop not just a more cognitively just and resilient policymaking process but an equally reliable science. However, while the point is well taken, I think we need to caution ourselves about two ideas. The late 1970s and 80s was the period of the emergence of the new social movements of science and the beginning of science criticism following the end of the `golden age of scientism' [Raina 2003]. This science criticism highlighted the importance of envisaging alternate sciences, alternate and dissident imaginations [Nandy 1980; Nandy 1988; Vishvanathan 1997]. While these ideas had a salience and a certain illocutionary force at the time, in the subsequent decades little has been done to push the horizon of their analytical possibilities and potential further. Similarly, when we used totalizing concepts like the `hegemonic authority of science' or the notion of `epistemological violence', we seemed to overlook that in the domain of ideas `alternatives' were never abandoned but only shelved to be pulled down from the shelf at moments that were ripe [Lakatos 1978]. The problem with totalizing concepts is that they seemed to bypass or ignore a whole range of questions and possibilities. If STS had highlighted the need for scientific reflexivity as science studies scholars we ignored the context of our own theorizing – that the world of knowledge making was always mined with conflict, in which there were successful theories that may have dominated the landscape for sometime but never forever [Collins 1998]. As Weinberg reminds us, at any one time in the world of science there are any number of competing theories and paradigms – even in the sciences [Elkana 2005; Collins 1998; Elkana 2005]. And so it seems that we appear to have overlooked the internal diversity within the sciences – let us not forget that the ecological sciences were once dissident sciences. By overlooking this aspect we seem to have neglected a thousand acts of resistance, many unsuccessful and a few successful micro-experiments from which we have still to learn, while we pursue that counter-hegemonic alternate imagination that has perhaps percolated even into the sciences in subtle ways.

Students of the history and philosophy of science are well aware that at any one time there are many competing paradigms, amongst which there could be a paradigm that is considered successful, which will over the passage of time make way for another one as it is undermined by its own success. An understanding of this process also requires a grounding in a robust theory of conceptual change. Just as there are many competing scientific paradigms, there are many competing alternate imaginations of which some reach the threshold of scientificity and some do not – Canguilhem has illustrated the process so carefully in the history of medicine [Canguilhem 1988]. But this evolution takes time, have long gestation periods, arising out of a long term and serious engagement with a range of problems that can be addressed or resolved. The presence of dissident scientists within the world of science is testimony to the presence if not visibility of these alternate imaginations within and outside the world of science.

The unique feature today is that many of these dissident scientists do not inhabit the world of regular institutionalized science but work outside that structure (One of the reasons Ziman uses the term post-academic) – the tireless environmental activist Anil Aggarwal belonged to that early generation. The fact that there is a significant number of trained scientists outside the conventional institutional structures of science indicates the movement of science and technoscientific knowledge into different realms of society where it is culturally and socially appropriated. This is precisely what Nowotny meant by the socialization of science and that the term post-normal science intends to capture. The objective of this essay was to set the context for these papers contributed by a young generation of scholars exploring the interfaces between institutionalized science and society, inspired by the larger concern of mapping and identifying processes for the democratization of science and decision making about public interest science.

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