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GUEST EDITORIAL

Science, scientists, and society: renewing the dialogue

Over the past century, there have been many points of intersection between organized science, governmental policies and patronage, and societal benefits and concerns. In India, these linkages achieved prominence largely after independence. As in the West, the initial engagement of science, polity and society was marked by optimism, enthusiasm, and a belief that science would enable and empower governments to address various national problems, thereby enhancing the quality of life of the citizenry. In more recent decades, the euphoria has subsided, in part as science and society have both undergone rapid, far-reaching changes. The darker side of even the well-meaning application of at least some scientific technologies has also become more apparent, with greater appreciation of the longer-term detrimental effects of many scientific fixes to problems in areas ranging from food security to energy to disease. Another change is that scientific research has, on the whole, become more expensive, leading to a greater societal expectation of accountability. Moreover, with rapid technical specialization within science, both science and scientists are increasingly being seen to be self-referential and out of touch with societal needs and aspirations. One unfortunate outcome of these changes has been a burgeoning anti-science feeling in a subset of society, most dramatically so in USA, but also, to a lesser degree, in India.

Thus, it is imperative to have greater clarity on issues like what expectations do society and the government have from science and scientists, and vice versa. This is essentially what has been referred to as the 'social contract of science'. In order to achieve this clarity, at least three major issues need to be acknowledged and addressed. First, what are the differences between how scientists, other academics and society view the nature and role of science? Second, how have changes in the way science is practised, evaluated and encouraged, and changes within society, affected perceptions about the social contract of science? Third, how can communication between scientists and society be enhanced, to generate better mutual understanding, so crucial to any rethinking of the social contract of science? We shall briefly outline some of our views on all three issues.

One big difference in how scientists and society view science is in the relative importance given to its utilitarian aspects. To many basic scientists, science is primarily a quest for understanding. To much of society, the purpose of science is to solve practical problems of daily life. The former think of science, primarily in terms of

brilliant conceptualizations explaining the mysteries of the universe. The latter primarily think of science as providing vaccines, cures for diseases, better crops, novel energy sources, satellites and varied civilian or military technologies. In the minds of most members of society, and governments, science and technology are Siamese twins, conjoined forever. Yet, for many scientists, technology is a very useful tool, but not to be conflated with science. Consequently, many scientists do not consider the primary role of science as being the solving of practical problems. That is seen as a secondary by-product, arising from the utilization of understanding gleaned from basic research. Bridging these two positions are applied science researchers and engineers, much more attuned to actual problem-solving with direct and immediate relevance to societal and governmental concerns. One shortcoming in Indian science, we believe, has been the dual expectation of basic and applied research from the same set of scientists. This cannot lead to outstanding basic or applied science, since the training, mindset, and approach of really good basic and applied scientists actually need to be somewhat different. The problem is that without a good foundation in basic science, it is difficult for a nation to actually do really good innovative applied science.

Another huge difference in how society and scientists view science pertains to the nature of scientific ideas as provisional knowledge. Society expects certainty: scientists are perceived to be dealing in factual truths about the world, not conceptualizations that work in some contexts, but not in others, or that may be overturned by new discoveries. Hence, legitimate disagreements and debates within science often drive disillusionment in society, with despair that scientists cannot even agree among themselves. The key difference here is that, in politics and many aspects of daily social life, confident certainty is seen as a virtue; in science, such levels of certainty would suggest intellectual arrogance. A simple example makes this clear – if a doctor was to say 'I cannot really figure out what is causing your symptoms', we, as organismal biologists, would empathize and say 'yes, it is hard enough to understand the basic biology of a fruitfly, let alone humans'; most non-scientists would conclude that the doctor was incompetent.

Within academia, too, there are differences between how scientists and others view science. A large proportion of scientists and their acolytes within society, fall into the 'scientism' fallacy of believing that scientific methods of

analysis and understanding are superior to others. It is also quite common among academicians of social science and humanities, and their acolytes, to dismiss science as being 'just one of many narratives'. Clearly, such dismissively patronizing attitudes will not foster a dialogue that could potentially lead to mutual intellectual enrichment. We are particularly pained by this, because, in our fields of evolution, ecology and behaviour, we routinely face problems shared by the so-called 'hard sciences' as well as the 'social sciences'. Evolutionary biologists, like historians, have to deal with contingency and lack of replication, but the approaches developed to deal with these problems are very different in the two disciplines. Similarly, ecologists and behavioural biologists invest great effort in trying to understand social behaviour and organization, as do sociologists and psychologists, but in very different ways. There are great, unutilized, opportunities here for mutually enriching dialogue.

To turn to the second issue, a major aspect of change over the past few decades has been the ascendancy of what we call the 'corporate culture', propagated by the business management weltanschauung. This is a problem for science and also for society at large. The relevant aspects of the corporate culture can be described as the beliefs that (i) every product/service can be conceptualized as a commercial commodity; (ii) specialized knowledge of a product/service is not necessary for its successful marketing; (iii) quality can be assessed via quantitative metrics and (iv) short-term measures of success are the only important metric for evaluation. Overall, this culture has had extremely deleterious societal effects by commercializing three important professions – education, healthcare and journalism – whose practitioners traditionally viewed their role as having a strong 'service to society' component. The results of applying the above mentioned beliefs to these professions are seen every day, and we will not belabour the point. This same corporate culture is also damaging science by adversely impacting how scientific research is presented, projected and evaluated. More importantly, this corporatization of science has contributed greatly to its self-referential nature with scientists increasingly choosing to work on problems likely to garner rewards in a system valuing hype and advertising more than solid science. This only exacerbates the disconnect between science and society, causing further erosion of mutual trust.

On the third issue, of communication between science and society, there are actually three aspects that need consideration. The first is the communication of scientific advances to society. This aspect of science communication has improved nationally and globally in the past 10–15 years, though there is still a way to go. The second aspect, where we feel scientists have not done a good job thus far, is the communication of our view of the scientific ethos to society. By giving a clearer picture of how we view science, and why, and its significance even for the utilitarian side of science, we would foster more nuanced societal expectations from science, and also contribute to the fostering of a 'scientific temper' on the twin foundations of skepticism and rationality. The third issue, which in India needs urgent attention, is the role of the

scientific establishment as a mediator and interlocutor between government and society on policy issues that have major scientific dimensions and also raise societal concerns. Such issues could range from genetically modified crops to nuclear power plants. The government–society interaction on such issues is typically highly politicized and often emotional. What is typically missing, though, is a balanced and apolitical set of scientific inputs that makes the debate more meaningful. This is where, ideally, the scientific establishment needs to be more active, in order to serve as a reasonably respected and impartial interlocutor, representing a community trusted by both government and society, to present a critical appraisal of the scientific aspects of policy in order to facilitate a meaningful cost–benefit analysis, in both economic and socio-political terms. This is a role played successfully by scientific academies and other scientific bodies in many western countries, and one that is as yet not embraced to the required degree by such bodies in India. Again, a certain level of trust is necessary for such an interlocutory role to be successful, and the first requirement for trust is dialogue and mutual understanding.

In this context, we are gratified that the Indian Academy of Sciences has recently announced a new initiative towards promoting meaningful dialogue between scientists and society. The idea is to have an open-ended and sustained dialogue amongst science practitioners, science policy makers, science administrators and educators, and society at large, so that all stakeholders can engage on issues pertaining to the practice, teaching and management of science as well as all aspects of the science–society interface. The hope is that this will give rise to a more inclusive and acceptable vision of the place of science in society, polity and culture. This initiative is centred around a new academic journal, *Dialogue: Science, Scientists, and Society* (<http://www.dialogue.ias.ac.in/index.html>), which is accompanied by a more informal, though moderated, web-discussion platform called *Confluence* (<http://www.confluence.ias.ac.in/index.html>). The journal will also serve as an umbrella for organizing public meetings to promote discussion and debate leading to a better mutual understanding between scientists and society. Two such events have recently been conducted in Bengaluru and Delhi (<https://www.youtube.com/channel/UC2IsroRkVYT8qiEytDnf2bg/videos>). It is our privilege to be associated with this effort and we hope that it will truly result in a meaningful re-imagining of the social contract of science.

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