Irreverence and Advancement

Irreverence is an uncommon word; in India it is also an unusual personal trait. A recent editorial in *Science* immediately attracted my attention when it proclaimed: ‘Irreverence and Indian Science’. The author, one of India’s most visible, influential and articulate scientists chose the medium of the flagship journal of US science to present a provocative view of the way forward for science in India (Mashelkar, R. A., *Science*, 2010, 328, 547). Irreverence, in liberal doses, appears to be a key ingredient for science in this country to break free of the shackles of mediocrity and bureaucracy. A cursory glance at dictionaries suggests that ‘irreverence’ is a term used to describe a disregard for authority and is most often associated with a good humoured disdain for perceived wisdom. The *Science* editorial declares emphatically that the ‘Nobel laureate Richard Feynman believed that creative pursuit in science requires irreverence’. A rebellious spirit is often a characteristic that one associates with the most creative people. In his essay Mashelkar draws attention to Freeman Dyson’s book *The Scientist as Rebel* (The New York Review of Books, New York, 2006). Dyson’s collection of essays, many of which are book reviews, are wide ranging but the title is taken from a piece in which he argues that ‘science is an alliance of free spirits in all cultures rebelling against the local tyranny that each culture imposes on its children’ (p. 4). Mashelkar quotes Dyson: ‘For the great Indian physicists of this century, Raman, Bose and Saha, science was a double rebellion, first against English domination and second against the fatalistic ethic of Hinduism’ (p. 4). While the first may be true, I am sure there will be many who will question the second. It is the word ‘rebel’ that needs the closest attention, for it is indeed used by Dyson in a special context. In his words: ‘Science is an art form and not a philosophical method. The great advances in science usually result from new tools rather than new doctrines. If we try to squeeze science into a single philosophical viewpoint such as reductionism, we are like Procrustes shopping off the feet of his guests when they do not fit onto his bed. Science flourishes best when it uses freely all the tools at hand, unconstrained by preconceived notions of what science ought to be’ (p. 17). For many readers like me, unfamiliar with Greek mythology, a quick glance at *Wikipedia* would reveal that Procrustes was a malignant figure who ‘would amputate the excess length’ of his guests in order to make them fit the bed. There is also the helpful explanation of a ‘Procrustean solution’ which ‘is the undesirable practice of tailoring data to fit its container or some other preconceived structure’.

Richard Feynman undoubtedly fitted the public image of a brilliant and irreverent scientist. His student, Dyson, describes him as a ‘rebellious spirit who combined a serious dedication to science with joyful adventures in the world outside’. Dyson’s analysis of the styles of two of the iconic figures of 20th century physics is penetrating: ‘Great scientists come in two varieties, which Isaiah Berlin, quoting the seventh-century-bc poet Archilochus, called foxes and hedgehogs. Foxes know many tricks, hedgehogs only one. Foxes are interested in everything, and move easily from one problem to another. Hedgehogs are interested only in a few problems which they consider fundamental, and stick with the same problems for years or decades. Most of the great discoveries are made by hedgehogs, most of the little discoveries by foxes. Science needs both foxes and hedgehogs for its healthy growth, hedgehogs to dig deep into the nature of things, foxes to explore the complicated details of our marvellous universe. Albert Einstein was a hedgehog; Richard Feynman was a fox’ (p. 269). In reviewing a collection of Feynman’s letters which were published, Dyson quotes from one written to a former student: ‘I have worked on innumerable problems that you would call humble, but which I enjoyed and felt very good about because I sometimes could partly succeed. . . . No problem is too small or too trivial if we can really do something about it’ (p. 270). This is a sentiment that should encourage the overwhelming majority of researchers who do not work on the ‘grand challenges’. In some sense, Feynman’s advice that scientists should enjoy their work is counter to a view held by many famous and successful scientists that ‘small’ problems are not worth doing. Dyson draws attention to the fact that ‘the vision of science as rebellion’ was first advanced by J. B. S. Haldane in a lecture at Cambridge in 1923, to the Society of Heretics. Haldane, clearly seemed to be addressing religious conservatism: ‘The conservative has but little to fear from the man whose reason is the servant of his passions, but let him beware of him in whom reason has become the greatest and most terrible of the passions’.
EDITORIAL

Reading Dyson’s essay I could not help concluding that ‘rebellion’ in the context he discusses and ‘irreverence’ as used in the Mashelkar editorial are different. Irreverence as an ingredient for improving science in India was probably first suggested by J. B. S. Haldane. In his characteristically brusque fashion he stressed the importance of being impolite: ‘I have already come to one conclusion as to why science in India is developing with disappointing slowness. It is not because Indians are stupid or lazy. It is because they are too polite’ (Science in Indian Culture, New Age Publishers, Calcutta, 1991; see also Current Science, 2001, 80, 1245). Haldane, a polymath, was famous for his disdain of authority. In his later years at the Indian Statistical Institute, Haldane expressed his dismay at the frequent travels of P. C. Mahalanobis by remarking: ‘The journeying of our Director define a novel random vector’. Haldane was often scathing in his assessments. In savaging the science fiction trilogy by the writer C. S. Lewis, whom he described as a writer of books which are intended to defend Christianity, Haldane pounces upon a Lewis’ sentence: ‘A wrong sum can never be put right: but only by going back till you find the error and working afresh from that point, never by simply going on’. Haldane points out that he is an ‘addict of the kind of “sum” called iteration’ and illustrates the virtues of approximation with an equation arising ‘in the theory of mosquito breeding’ (http://www.marxists.org/archive/haldane). Haldance and Feynman display the irreverence that can only be admired in the most gifted.

I began this column intending to discuss the Science editorial on ‘Irreverence and Indian Science’, but digressed on encountering Freeman Dyson’s entertaining collection of essays. In returning to my original theme I must ask: What is the context in which irreverence is advanced as a key ingredient in transforming science in India? Mashelkar suggests that irreverence is sadly ‘missing in Indian science today’; a consequence of a ‘traditional attitude that condemns irreverence’. He then lists the factors that stifle creativity: a cultural inheritance that inhibits questioning, an educational system that successfully suppresses originality and a bureaucracy that operates in an impenetrable cloak of conservatism. In a telling commentary on a system that he undoubtedly knows well, he quotes from the speeches of two Prime Ministers, Atal Bihari Vajpayee in 2001 and Manmohan Singh in 2010, delivered at Science Congresses separated by a decade, both of whom deplore the stranglehold of bureaucracy. He notes: ‘Alas, during the intervening years little had changed’. Mashelkar’s ‘relentless optimism’ surfaces in his last paragraphs when he brings the ‘good news’, undoubtedly to a Western audience, that ‘the environment is about to change’. He highlights the ongoing transformation of higher education, following the dramatic expansion in the number of institutions and suggests that new laboratories ‘are fostering a new culture of innovation’.

This surge of optimism is also engendered by the fact that foreign companies have established 760 R&D centres that employ 160,000 researchers, many of whom are Indian returnees from abroad who bring with them different innovation and work perspectives, whilst at the same time reversing the brain drain’. He then exemplifies the spirit of irreverence that appears to be permeating Indian industry by noting that ‘the recent launch of Tata Nano, the world’s least expensive automobile’ embodies a new ‘spirit of adventurism’. Reading Mashelkar’s editorial I was left with the feeling that the irreverence he favours may have little to do with Freeman Dyson’s ‘rebel’ or the non-conformism of Haldane and Feynman. It is hard to imagine irreverence as a motivating factor in the many new industrial R&D laboratories being set up by foreign companies. The biggest among them seem to be structured, organized, efficient organizations with clear mandates and directions from their parent companies. The weekly (or sometimes daily) videoconference with a disembodied supervisor can hardly stimulate irreverence. Science is now a highly organized, professional and multi-national activity. The days of the talented amateurs appear to be over. As an aside I must mention that Dyson’s collection also contains an essay ‘In Praise of Amateurs’. Interestingly, Dyson notes that ‘in the nineteenth century professionals such as Michael Faraday and James Clerk Maxwell were the rule and amateurs Charles Darwin and Gregor Mendel were the exceptions’ (p. 181). By modern standards we might label all these great figures as ‘irrelevant amateurs’. Irreverence is not a quality that is easily found in the most celebrated laboratories of science today. The demands of competition, relentless pressures to perform and the need to continually generate research support are not factors that promote irreverence’. Fortunately, many problems that need to be solved will undoubtedly succumb to the superior might of technical tools that are employed in the search for solutions.

While promoting ‘irreverence’ in India may provide a welcome breath of fresh air in our laboratories, there must be other ingredients which may be needed to catalyse transformation. Mashelkar concludes: ‘If India can thereby build the spirit of irreverence that Feynman endorsed, then surely Indian science will create many Ramans of the 21st century’. Success will undoubtedly need more than irreverence. It will need professionalism, a clear understanding of the virtues of collaboration and cooperation and an honest and rational system of measuring and assessing performance. It will also require commitment, enthusiasm and resilience. The institutional structure of Indian science is pyramidal. Adapting an idea from the late C. K. Prahlad, renowned in the management arena, there may be riches that need to be uncovered at the bottom of the pyramid.

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