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## EDITORIAL

### Lost innocence

*'We may say that we are living on an island of guncotton. But, thank God, we have not yet found a match that will ignite it.'*

– Walther Nernst (1921) quoted in *Brighter Than a Thousand Suns*, Robert Jungk, Penguin Books, 1960, p. 19

Every year in mid-July the Indian Academy of Sciences holds its mid-year meeting at Bangalore, invariably in the sylvan and peaceful campus of the Indian Institute of Science. At these meetings, there are several talks intended to disseminate science on a broad front, and there are others by newly elected Fellows and Associates, which give an opportunity to the greying members of the Academy to have a first-hand look at the new generation. Traditionally, the meetings are low-key, sedate affairs, with most lectures providing a level of scholarly detail that usually leaves the non-specialist mildly bewildered. The Academy, founded in 1934 by C. V. Raman, clearly laid out its charter in a 'memorandum of association'; its foremost objective being *'to promote the progress and uphold the cause of science, both in pure and applied branches'*. Some four decades after its founding and not long after the death of its founder, the Academy re-examined its role. In a clearly written statement the Academy noted: *'Science has emerged today as the most revolutionary co-operative activity of mankind. In the scientific method lies a validity and universality which transcends any other principle devised by man. Science seeks and discovers, cutting across sectarian, national and ideological frontiers. It fosters cooperation and generates a value system which nurtures man's highest capabilities and aspirations'*. Recognizing that in India a situation exists, *'where almost every facet of life needs to be revitalized, retaining a clear perspective for the nurturing of the scientific temper is of the utmost importance'*. The Academy committee also noted: *'In a country beset with prejudices, rules and bureaucratic formalisms, it is of the greatest value that working scientists, specially Fellows of the Academy, promote by personal as well as collective example, the principle of rational thought... By applying rigorous standards of scientific criticism at all levels in a constructive sense, the Academy considers that the scientific community has a unique contribution to make not only to the flowering of science in India but also to national character.'*

Like all of India's growing number of science academies, the Indian Academy of Sciences too has

generally maintained a low profile, rarely seeking to express a collective opinion on any issue of public consequence. Most often, this sphinx-like silence is the only sensible course of action, as opinions amongst its fellowship are, undoubtedly, widely disparate. The Academy's focus on science and its dissemination has served it well; the publication and educational activities ensuring that it is not hampered by the image of an exclusive country club.

This year the mid-year gathering began with an opening lecture intriguingly titled, 'The Scientific Objectives of Pokhran II'. Delivered with clarity and aplomb by the former Chairman of the Atomic Energy Commission, R. Chidambaram, the lecture was intended to describe the science and technology behind the nuclear blasts. The speaker has the rare distinction of being a key participant in both the Pokhran I and II experiments, separated by almost a quarter of a century; a period in which we have made a transition from the idea of a 'peaceful' nuclear explosion to a more pragmatic appreciation of the values of nuclear deterrence. A major issue that has developed in the aftermath of the events of May 1998, has been the estimation of the magnitudes of the explosions. There appear to be two sides to this apparently technical issue. The scientists from the BARC would like to place the nuclear explosion yields as close to that originally planned, as proof of the success of a long designed experiment. External observers, primarily Western, would like to estimate significantly lower yields, presumably to minimize the apparent 'success' of these experiments. Beyond the breast beating, there is also the problem of the Comprehensive Test Ban Treaty (CTBT) looming in the background; technology to detect small nuclear tests is desirable for some, while technology to facilitate underestimation of yields by distant observers may be desirable for others. Chidambaram's lecture outlined many of the pitfalls in yield estimates and provided a spirited defence against contradictory estimates published in the literature, including a recent article in this journal (Douglas *et al.*, *Curr. Sci.*, 2001, **81**, 72). Seismology and geology appeared to be the fields clouding the precision of the yield estimates. There were interesting sidelights presented by the speaker, including his description of the tendency of both the Americans and Soviets to over-estimate the yields of the other's tests at the height of the Cold War. This strategy provided an opportunity to claim that the opposing side was cheating on the provisions of

the 'Test Ban' treaties. But, in large part, there were frequent references in the lecture, to the kilotonnage of the blasts, with some comparisons to the magnitudes of the explosions with those that laid waste to Hiroshima and Nagasaki, in the cataclysmic, dying days of the Second World War. In the discussion that followed there was even some banter on the yield estimates; after all even 5 kilotons would leave the 'job' well done.

The lecture left me uneasy. It was undoubtedly well delivered, with a definitive air of technical authority, which held the attention of a full audience in the Faculty Hall of the Indian Institute of Science; a hall where I have over the years heard many wonderful expositions of science. The question which bothered me, however, was this: 'Did not the Indian Academy of Sciences find the topic incongruous for its gathering?' There is, presumably, little new physics to be gleaned from nuclear blasts and even if there were, this was not undoubtedly the purpose of the explosions. Clearly, the Pokhran blasts had many political and strategic motivations; their successful conclusion demonstrating that the enabling technologies work well in the hands of the establishment entrusted with the task. Science and its advancement are not even peripheral motivations and they need not be. Why then does an academy of science seek to clothe an experiment of great significance in the real and important world of geopolitics in the garb of science? Even in cases of controversies that lie in the domain of science or its borders, our Academies (probably, rightfully so) maintain a studied and pragmatic silence. Was it then necessary to suddenly move to a proactive stance and provide a public forum for a dispassionate overview of the power of an immensely destructive weapon and to rejoice in the presentation as an example of an indigenous scientific triumph? Would it not have been better for the Academy to limit its domain to conventional academic science and avoid straying into the difficult waters of strategic science and technology.

There has always been in the worldwide community of scientists a tendency to adopt 'an ostrich-like policy' on most politically sensitive matters. As early as 1947 James Franck analysed this failing: '*It is a custom in science – and perhaps a principle – to select from the infinite reservoir of unsolved problems only those simple ones the solution of which seem possible in terms of available knowledge and skills. We are trained to subject our results to the most severe criticism. Adherence to these two principles results in our knowing very little, but on the other hand being very certain that we know this very little. We scientists seem to be unable to apply these principles to the immensely complex problems of the political world and its social order. In general we are cautious and therefore tolerant and disinclined to accept total solutions. Our very objectivity prevents us from taking a strong stand in political differences, in which the right is never on one side. So we took the easiest way out and hid in our ivory tower. We felt that neither the good nor the evil applications were our responsibility.*' (quoted

by Robert Jungk, *Brighter Than a Thousand Suns*, Penguin Books, 1960, p. 41). Robert Oppenheimer, the Hamlet of the nuclear age was troubled by the 'success' of the first experiments that he orchestrated, when he said in 1945: '*I think it is for us to accept it as a very grave crisis, to realize that these atomic weapons which we have started to make are very terrible, that they involve a change, that they are not just a slight modification: to accept this, and to accept with it the necessity for those transformations in the world which will make it possible to integrate those developments into human life.*' [Robert Oppenheimer, *Letters and Recollections* (eds Smith, A. K. and Weiner, C.), Harvard University Press, 1980, p. 318]. Even the end of the Cold War has not dimmed the intensity with which American arms programs are pursued, the nuclear missile defence systems and the space bomber projects illustrating the firm hold that the military-industrial complex has on governance. Ironically, in the first flush of excitement after Pokhran II, there were many reports on the importance of linking defence requirement with industrial development, even in India. There seems to be a more subdued tone now.

In this context the Academy's decision to celebrate Pokhran II and its scientific objectives, in an opening lecture at its recent meeting, is curiously inappropriate. The increasing association of science in India with government functionaries and the complete sidelining of academic science may not have found favour with the Academy's founding fathers. In reflecting on nuclear weapons and our collective fascination with them, I was reminded of Robert Southey's poem *After Blenheim*, which commemorates the carnage in the battle won by the Duke of Marlborough in 1704. Old Kasper describes to his grandchildren the famous victory:

'They say it was a shocking sight  
After the field was won;  
For many thousand bodies here  
Lay rotting in the sun;  
But things like that, you know, must be  
After a famous victory.'

'Great praise the Duke of Marlboro won  
And our good Prince Eugene.'  
'Why, 'twas a very wicked thing!'  
Said little Wilhelmine;  
'Nay . . . nay . . . my little girl', quoth he,  
'It was a famous victory.'

'And everybody praised the Duke  
Who this great fight did win'.  
'But what good came of it last?'  
Quoth little Peterkin:-  
'Why that I cannot tell', said he,  
'But 'twas a famous victory'.

The Academy, like Wilhelmine and Peterkin, appears to be losing its innocence.

P. Balaram