The great divide—Can we bridge it?

[Guest editorial]

Recently, I retired after nearly four decades of official service as a scientist. It was an occasion for stock taking and while I could not give myself credit for earth-shaking discoveries, I was able to pat myself for a few minor achievements. My self-congratulatory mood was, however, rudely shattered by a letter (see box), which I subsequently received.

I do not know how this science teacher living deep in the heartland obtained my address or why he wrote to me. Be that as it may, I was moved and also deeply troubled for all of a sudden it seemed as if my professional life had not been very purposeful. It is of course patently obvious that no single individual can do anything significant by way of solving the massive problems faced by this country but that did not prevent me from reflecting on whether or not we Indian scientists (including me), have done our bit.

To compare is human tendency, and while discussing 'Whither Indian Science?' with interested colleagues one invariably tends to compare the lot of scientists in India with their counterparts elsewhere. As always happens, in this syndrome of 'us' versus 'them', one compares oneself only with others better off. This brings to my mind one of the several seminars on *A National S&T Plan* which C. Subramaniam organized while he was the Minister for S&T. This was in the early seventies, and the particular seminar I am referring to was held in the impressive Central Complex auditorium of BARC. While the discussions were going on, one lady (obviously a teacher) interrupted to ask: 'You people are all making grandiose plans. Have you wondered where your scientists are going to come from? I do not see much mention about the promotion of science education in schools. By the way, how many of you have seen a rural school? Are you aware of one-teacher schools? Are you aware that in many villages the entire school is run under a stately pipal tree with just one teacher, and no blackboard, chalk, etc.? Or do you intend to hunt for potential scientists only in elite city-schools?'. No doubt it sounded like rhetoric, but the intervention did produce a stunning silence. Alas, the silence was short-lived for soon the debate went back essentially to how to catch up with the Joneses.

I am second to none in pleas for scientific excellence, Indian science being at the forefront and all that, but it does seem that as a community we scientists tend to duck hard issues relating to our national responsibilities. It is of course easy to give excuses (especially in our environment where excuses are plentiful) but that does not exactly absolve us. Let us take science education for instance. What have we to show? In America there is Edward Purcell (N.L.) taking the trouble to write a college-level book on electricity and magnetism and also produce film strips. How many examples of that kind do we have here? Then there are instances of leading universities and industry coming together to organize orientation-programmes for science teachers. The American Physical Society (APS) actively collaborates with the American Association of Physics Teachers (AAPT) on many matters, and every year they hold a joint session together. I vividly recall one which was addressed by Freeman Dyson and George Gamow. In India there is a fairly active association of physics teachers namely the IAPT, but there is hardly any evidence of purposeful linkages between professional physicists and the IAPT.

I do not wish to sound like an old man crying foul after his innings is over for I hold myself *as guilty* of these shortcomings as I do my counterparts. Shortly I shall strike a more positive note but first I must make a couple of more remarks in the present vein to stress my point. Sometime ago while I was heading a lab, I sought the collaboration of a learned professor in one of our leading educational establishments. My effort was part of a campaign to have a lab–academia consortium. After listening to my pleas this professor said: 'Look, you are doing work which is useful but not interesting whereas I am doing work which is interesting but not useful. How can there be any collaboration between us?' This being the prevailing climate, is it surprising that there was not even a whimper of protest from our scientific community when the US clamped a totally unreasonable technology embargo on ISRO? Contrast this with what happened in Russia when Ronald Reagan ordered the National Academy of Sciences to suspend its collaborative activities with the USSR Academy following the Afghan invasion, and to boot banned the export of PCs to USSR. Russian scientists took up the challenge and developed PCs. A few years later when an American physicist visited the high-energy lab at Dubna near Moscow, his Russian counterpart remarked: 'Please thank your President for banning the export of PCs; otherwise we would never have designed and built our own versions.'

However much one might protest or argue, we have, (barring a praiseworthy few) in our preoccupation with the pursuit of excellence etc., remained largely indifferent to national priorities and problems. I might be taken severely to task for such utterances but consider the stark reality of Kabiraj's statement, 'We the villagers are receding from the benefits of science and technology day by day'. One cannot simply wish away such a remark, whatever might be our own priorities

and compulsions. In other words, in the midst of our quest to improve Indian science, getting more funding for it, etc., we must *also* not lose track of society's expectations. We cannot shrug away our responsibilities and maintain a clinical aloofness from society's problems, claiming that they must be solved by politicians and administrators alone. We *too* have a role and if we fail to play it, then we would have only ourselves to blame when public enthusiasm for science declines, (as it now appears to be happening, after decades of euphoria). Perhaps the reader is tempted to say: 'Enough of polemics. Do you have anything concrete to suggest?' Yes indeed.

My suggestions derive inspiration from the example of Raman who was uncompromising in his pursuit of science but *never* grudged time for students and for taking science to the public. Today of course we can no longer depend on such a one-man show (especially as the scale on which we have to operate is *much* larger) but the *spirit* of the exercise remains the same namely, that each one of us must willingly and in all sincerity set apart some time for community-oriented activities. Clearly, any effort made must be coherent, cooperative, and properly coordinated—which means that it is not something which individuals do at random; rather it must be orchestrated by various Academies and professional bodies after first coming together. (Whether we have the will and the discipline for such an exercise is a different matter. If we do not, it would be a sad reflection of our apathy.)

Any meaningful programme would necessarily cost money. Whenever the question of money is raised, the cry immediately goes round: 'We are a poor country. We can't afford all these.' The scientific community should roar back: 'This country *deserves* such programmes and can certainly afford them much more than the totally unnecessary bandhs, rallies, counter rallies, rail rokos, rasta rokos, political tamashas, garnish posters, hazardous cutouts, etc., all of which in some manner or the other, eventually boil down public expenditure, loss or waste money.' Strong words? Why not? Did Raman ever hesitate to call a spade a spade (bridge fans would say two spades!)? Coming to brass tacks, how to raise the money? Well, why not a special fund via tax concessions? Creation of such a fund would no doubt need strong articulation and waging a relentless campaign but here again one could derive inspiration from the manner in which Raman collected funds for his Institute.

Appeals by isolated individuals will obviously not work but a strong and *sustained* campaign by a group of eminent scientists who command respect cannot fail to yield results. If a tax concession is available, surely one could persuade several big companies to make generous contributions. One could also think of a cess associated with any import of technology. Once one begins to think along such lines, I am sure many ideas would emerge.

Getting funds is but the first step. Next would come a master strategy and a coherent plan to implement the strategy. Since temperament varies from individual to individual, it is pointless to expect every scientist to perform voluntary service in an identical manner. At the same time it is quite conceivable that everybody can be made to contribute to such community-oriented programmes suitably. Thus while some could participate in developing say demonstration kits, others could organize popular lectures, form and run science clubs, write books/articles, produce film strips on science, plan curriculum reform, conduct orientation camps for teachers and so on. The possibilities are endless. To ensure success it is obvious that there must be some public involvement also, especially in the formulation of plans and in the mechanics of their execution. Otherwise we might end up offering something which is not palatable.

Everyone is aware of the strong grass-root movement for the promotion of science that exists in Kerala. I have seen some of its efforts at the time of Bhopal tragedy. A group of workers belonging to this movement were on a *Padayatra* and came to a village near Kalpakkam (where I was at that time). This group interacted with the teachers and students of the local school and staged a streetplay on pollution and its hazards. Many of those who took part were locals. I believe the message went home and produced a good impact. Properly nursed and sustained, such activity could snowball and produce a significant impact on a national scale. If somehow we scientists, one and all of us, could work together, stimulate the formation of grass-root organizations and later guide them, there could be a sea change. In a recent issue of *Current Science* (1993, **64**, p. 145) there was a thought-provoking article on Unnecessary Injections. Supposing we motivate our troubled teacher to make a study in his village along the lines suggested in this article? Would that not be an excellent way of involving him and assuring that we are not distancing ourselves? It is such bridges that are needed. Provided we have the required sensitivity, the possibilities for such bridges are simply unlimited.

I shall not attempt to sketch a detailed plan of action. Such a plan, if it is ever brought into being, must clearly be arrived at after proper consultations and through discussions. I shall merely stress that we cannot expect any meaningful results from incoherent or sporadic activities here and there. If we mean business, and I believe we should, we must have a *coherent* national plan coupled with a *strong commitment* from our side; otherwise nothing much is going to happen. When America was shocked by the launch of the *Sputnik* it rose up as one nation; and that produced

results. We, on the other hand, seem to be immune even to shocks like the Bhopal tragedy or the technology embargo on ISRO. I hate to say it but our self-imposed slumber is to a certain extent rooted in our self-interest. I do not expect scientists to be like yogis and be completely above self-interest. At the same time, unless we show some concern for national matters we would have only ourselves to blame if the public becomes disenchanted with us. Leave aside the popularization of science and rural welfare. Our Academies hardly ever articulate with sufficient force even on matters strictly relating to scientific research and technology.

Service to the community may not exactly be popular as it would necessarily cut into our time but then it is like paying tax. Hardly anyone likes paying tax but if everyone cheats on tax, the country's economy would clearly be in the doldrums. I believe the analogy is appropriate. Having lived for two decades in Bombay, I have seen the tension that builds up in slum dwellers who watch with envy the prosperity of those who live in skyscrapers. And when tension builds up beyond a point, there is serious trouble. The lesson is relevant. It is all well for us scientists to lament about our hardships, lack of funds, etc., but unless we do something visible and tangible for our country it is futile to expect public support. We cannot take shelter under the argument that our counterparts in other countries do not do such things. That would be like saying: 'But they don't pay income-tax in Bahamas!'

Once I was in a DST meeting where some of the scientists were pressing for E-mail, declaring that they would all become obsolete if funds for such necessities are not made available. I agree E-mail is needed but should we not also bother to do something pointed and specific for the country and for the less fortunate members of our society? The claim that doing good science is adequate service to the country is, I am afraid, no longer going to wash.

I am sorry if my remarks annoy some readers. But then, from the days of *Mahabharatha*, truth has not been either pleasant or easy to face. To expect public support and funding without quite doing our bit is like expecting a rich harvest of fruits without being concerned about watering the sapling. Indeed one wonders whether we have even bothered to plant the sapling!

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Science and technology in a poor country

Current Science deserves congratulations for bringing out an excellent collection of articles on basic science in November 10 and 25, 1992 issue, and for seeking response from the readers. The eminent authors have clearly brought out the present strengths and weaknesses of Indian Science and Technology. I wish to add a few more relevant points for consideration of the scientific community. In any discussion on science in India, we forget that we are talking of science in a large country which ranks among the twenty poorest nations of the world on per capita GDP basis[1] and ranks 123 on human development index[2]. Other indicators of our economic and social backwardness—high infant mortality, high illiteracy, etc. are well known to be mentioned again. The scientists, like the other elites of the society, even when reminded, tend to ignore these facts. Since, we think that intellectually we are as good or better than our counterparts in the rich, western world, we refuse to recognize the harsh realities of the poverty of the nation.

The general sentiment of the scientific community is well reflected in C. N. R. Rao's statement 'In spite of the modest support for science and technology the Indian scientific community has hitherto performed well'. Some may like to add 'could have done better, if...'. As pointed out by Rao, science and technology are intimately related to productivity, economic development and international competitiveness. So what should be the goal of science and technology in a poor country? To generate wealth. The questions that should be answered are the following: How much wealth have we created based on indigenous science and technology? Investment in agricultural research has for sure contributed to rural prosperity in many parts of the country. What has been the return on the investment in other branches of science? What percentage GDP is contributed by indigenous technology? An appropriate notional monetary value can be given to the societal gains, such as, in health care or environment where the returns cannot be quantified in monetary terms. The rate of return on research investment is estimated in advanced countries which helps in investment decisions. Further, subcritical funding in many different areas does not contribute to reaching the goal, and hence, brings no returns. Defence-related investment in research should be excluded out of this. While expenditure on higher education contributing to manpower development should be linked to the investment in