

the largest geologist communities in the world. Expectations are therefore high. Collaboration between universities and research institutions, such as WIHG, can solve some of the instrumentation and information (journals) problems facing universities as well as strengthen human resources at research institutions. On a global scale, perhaps the time is ripe to establish an International Society of Himalayan Geoscientists (or whatever name it may be given) because the British heritage and native developments in Himalayan geology are now parts of a new era in our science – one that is global.

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The role and responsibility of a scientist in the Indian context*

Rajaram Nityananda

One can try and define the role and responsibility of a scientist in many ways. The approach here is to try and describe the kind of scientific community we would like to build up in the Indian context. The views that I will be expressing are based on my own first-hand experience and observations as well as discussions over the years with friends and colleagues. It goes without saying that a different person would express different views. My own overall perspective is based on the idea that it is a privilege to be involved in scientific research. The feeling that we are being supported by others in our efforts to answer questions about the universe has been expressed in the following words with which a world-famous textbook on gravitation (*Gravitation* by Misner,

C. W., Thorne, K. S. and Wheeler, J. A., Freeman, 1973) begins:

‘We dedicate this book
To our fellow citizens
Who, for love of truth
Take from their own wants
By taxes and gifts
And now and then send forth
One of themselves’

Indeed, every Indian scientist has been sent forth on his research career by contributions from people whose own basic needs have not been met. This is very much like a poor family saving to educate one of their members. It is therefore natural to ask ourselves what society gets in return. Frankly I do not think that the direct results of research provide the complete answer. At its best, a community of scientists can also act as the custodian of information, knowledge, understanding and skills all of which have to be preserved, improved and passed on to posterity. This was dramatically illustrated in China some time ago when the entire system of learning and research was dismantled in the name of the cultural revolution. It then had to be painfully built up

again. One consequence of this role is that scientists as a body have to be deeply concerned with what happens in schools, colleges and universities and must try to help, even though there are well-known constraints and difficulties.

Another significant potential role is to act as an example of the spirit of healthy skepticism, systematic inquiry, and logical debate. Perhaps this is what some people have called the scientific temper. More importantly, in my opinion, scientific achievements on our soil contribute to a sense of motivation, self-confidence and self-reliance that is as important to a nation as it is to an individual. We have all witnessed this in the world of sport. Whenever Kapil Dev or Gavaskar is in his heyday every little boy in the street with a ball or a bat walks a little taller. As a negative example we have our Institutes of Technology where I have personally witnessed bright young students being brought up in an atmosphere of cynicism and self-depreciation concerning science or for that matter anything else in our country. Little wonder that these institutes essentially function as tutorial colleges feeding American universities.†

*This is the text of a talk given over All India Radio on a subject suggested by them in 1991. It was not a response to any single event or issue but simply to the challenge of collecting thoughts on a subject which, though important, one had not considered before in a systematic way.

†This first hand experience is 25 years old.

Any contribution to society will ultimately be proportional to our effectiveness as scientists. One of the crucial facts here is the rapid and ever-accelerating pace at which new developments are occurring in every field. We are used to the idea that no-one today wants a radio which uses vacuum tubes or a computer reading punched cards, both of which were quite acceptable twenty-five years ago. We however, have to concede that a good fraction of research activity in the country tends to be as out of date as valves or cards. It is not merely a lack of funds or new equipment. The idea that one has to keep renewing one's scientific base has to gain wide acceptance. The days when a doctoral degree and a research or teaching position meant living happily ever after cannot be allowed to continue. Most industries put in a lot of effort in trying to come up with new products and processes. There is a danger that the manufacturers of plastic buckets will prove to have been more responsive to changing times than the scientific community! Pushing the parallel with industry one stage further, it is widely being realized that sick industries have to be diagnosed as such and either revitalized or closed down with their human and material resources redeployed for more productive activity. In all honesty, we have to admit that there are universities, laboratories, and institutes which are wholly or partially sick in the same sense of having ceased to carry out their function. The first person who succeeds in closing down such a group or institution will, in my opinion, deserve as much honour as we now accord to the institution builders of post-independence India such as Homi Bhabha. There was wisdom in our forefathers giving equal importance to creation, preservation and destruction in their pantheon.

Having stressed that we should keep up with the world when necessary, one should not forget that we have to be different from the rest of the world when necessary. As an example, medical research in our country has to have very different priorities from that in the western world. The same applies to parts of biology and geology and to many kinds of technology which have to suit local conditions and requirements. Even when the topic is the same, the point of view or approach do not have to be identical to

that prevailing elsewhere. It is this kind of diversity which will make our contribution to the world's pool of science worthwhile.

Our science will finally be judged by its excellence – by the peaks attained by individuals and teams working in our country. It is not given to everyone to reach such peaks all the time but just as in mountaineering, many people have to contribute to enable a few to reach the top. The leader of the first successful Everest expedition never stood on the peak himself, and had to make the difficult decision of concentrating all the resources on a few selected members. The way that this can occur in science is rather different because the community consists of independent and competitive individuals used to thinking and acting for themselves. Yet the system finally has to single out some of them. Ideally, this is achieved by open competition and fair assessment within the community.

This also implies that individuals have to be prepared to assume different roles at different times, since yesterday's best is not going to be tomorrow's. This may seem to be an obvious principle but has far-reaching implications. The conventional institutional and career structure prevailing today assumes that a person's abilities steadily increase till the age of sixty or even beyond. This was probably never true but is going to be even more untrue in the years to come. One would like to hope that our institutions will evolve toward a pattern where a person's role is determined by his current ability to carry it out. Lest this seem like a brand new concept, let me remind you that more than three hundred years ago, Isaac Barrow resigned his professorship of mathematics in Cambridge at the age of thirty-nine to make way for a twenty-seven year old successor. Admittedly, it was an exceptional case because the successor was Isaac Newton. Nevertheless, the concept of Vanaprastha – of withdrawing from privileges and power in order to look inwards – may not be without application in scientific institutions.

There is one more world-wide trend which is very relevant to making our science more effective. Very often, large and expensive facilities are needed and it is essential that they be well utilized. This problem exists everywhere in the world but would naturally be even more

acute in our country. The astronomers world-wide have taken the lead in tackling this situation. For example, one of the world's most powerful radio telescopes called the Very Large Array is located in the United States, but accepts observing proposals from all over the world which are selected purely on the basis of scientific merit. This system is spreading to other areas like large-scale computing. Of course, a lot of hard work goes into setting up the facility and constantly weighing the merits of the large number of proposals which come in. A complex social system has evolved to cope with the problem of assigning credit and reward fairly in such a situation. But in the long run, science as a whole benefits from such a pooling of resources and ideas. Our community too will have to make the transition from individual empires to common and shared facilities.

To sum up, I have focused on the kind of changes that are needed if scientists are to be a force to reckon with in our country and not some semidecorative appendage. The main role and responsibility can be seen in terms of the challenges which have to be faced. These include training, external competition, internal obsolescence, and the effective allocation of increasingly scarce resources. I should add that at least in some fields, one can already discern the beginnings of such changes. Young researchers who are not at the top of any hierarchy now have access to independent funding and recognition. The head of the department, once a position held onto tenaciously till death or retirement, now rotates in many institutions. Research of quality is carried out at more than one centre so that meaningful criticism and collaboration is possible within the country. If such trends continue and spread, we can look forward to scientists building up a community and a movement which is bigger, better, and longer lasting than any single individual. The burden of roles and responsibilities might seem heavy. But as I mentioned at the beginning, no price is too heavy when one is solving interesting problems, enjoying it, and being paid for it.

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