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GUEST EDITORIAL

Emphasis on scientific research – the flip side

Once upon a time, scientists were assorted individuals who investigated whatever natural phenomenon caught their fancy. Theirs was essentially an amateur activity, and not done primarily for their livelihood. Even universities were quite content to have their professors just ‘profess’, i.e. impart to students their understanding of their subject. Whatever research they indulged in, was done of their own volition.

Needless to say, the situation is very different today. The breadth and intensity of scientific research has grown enormously, with over a million professionally paid practitioners worldwide. This growth in pure science owes in turn to the explosion in technology, which has become an all-pervasive component of modern societies, their industry, economic growth and defence preparedness.

The growth of technology has vastly increased the scope and depth of investigations in pure science by making available more sensitive and powerful instruments leading to breathtakingly sophisticated experimental work. In addition, computerization of the equipment and data analysis have enabled investigations unimaginable earlier. Furthermore, the tens of billions of dollars that research in technology consumes have made it societally more acceptable to allocate sizeable funds to pure science as well.

Unavoidably, along with this, the functioning of scientific research has also adopted some corporate overtones. Terms like ‘productivity’ and ‘output’, traditionally used to assess the success of conventional industries, are now also used in evaluating the research work of pure scientists, as if they too were turning out ball bearings. The more successful scientists lead very busy lives, like business executives, rushing back and forth to meetings, preparing power-point presentations and writing proposals.

But this editorial is not yet another nostalgic diatribe against modern science. Returning to science done the old way is neither practicable nor desirable. Specifically, we in India (to which the rest of our discussion will be addressed), should applaud our Government for creating so many well-funded institutes devoted primarily to pure scientific research (henceforth collectively referred to as ‘Institutes’). They enjoy good working conditions, decent administrative procedures, infrastructure, and most im-

portantly, recruitment and promotional processes. High-quality research made possible at these Institutes has brought for many of their scientists, as individuals, public accolade and prosperity. Collectively, the success of these Institutes has also enhanced the prestige of science and the very activity of scientific research in the minds of our bureaucratic and political classes and the media. In and of itself, that too is a good development.

Unfortunately, this emphasis on research has been overdone and resulted in a highly skewed development of organizations pursuing science. The scientific community *does not consist only of those working in the Institutes*. There are the 47 central and over 360 state universities plus thousands of colleges whose science faculty members also consider themselves to be scientists as much as those in the Institutes, and rightly so. Indeed, in the old days, the best science was done mostly in the universities. That holds even now in the West.

However, for a variety of reasons, while our Institutes have proliferated and prospered, university science has been left trailing way behind. The problem has not been so much a shortage of funds, but the steady drainage of quality manpower.

The superior working conditions, facilities and salaries at the Institutes and the IITs have been attracting the best new talent in the market, at both the faculty and student levels. As more and more talented scientists and students started joining Institutes instead of universities, the relative prestige and ‘rating’ of the latter kept dropping, worsening the situation further. Today, universities are finding it more difficult than ever to build good science departments and attract a healthy fraction of the most talented students.

Inevitably the quality of students emerging from universities began to decline. Colleagues from Institutes started bemoaning the poor preparedness of the incoming Ph D students they were getting from universities. (Their complaint was valid. This writer was once a Professor at an Institute.) But less valid was the tacit extrapolation that universities had become irredeemable, damaging their students beyond repair. Some research Institutes like IISc have started undergraduate programmes of their own ‘to catch them young before they are ruined’.

It was also decided that new organizations had to be established to train and feed students for the elite researchers. Thus were born the fleet of Indian Institutes for Science Education and Research (IISERs). We believe the IISERs are doing a good job of training bright students. One hopes they will continue to do so and prosper. However, all these developments have undercut the only *raison d'être* remaining for the existing universities – educating the best of the country's students.

Hailing research as an undisputed virtue to be cultivated by all has had other unfortunate consequences. Over the decades, pressure has increased on all university teachers to keep doing new research throughout their working lives, as an important component of their duties. Selection committees examining candidates for promotions or new positions at universities go overwhelmingly by their research record and indices of its 'impact', even though the candidate might have supplied reams of information about his/her other contributions, especially in their classroom and laboratory teaching.

Consequently, most scientists in universities and even colleges are engaged in some form of basic research. However, barring many exceptions, that research neither advances science significantly nor benefits industry. Nor does their work give them much personal joy beyond brief periods of elation when their student gets his/her Ph D, or a paper is published. Worse still, each such person gives birth to several more, viz. his/her Ph D students, most of whom again end up with academic jobs. This perpetuates the chain reaction of an ever-expanding body of people doing pointless 'research'.

Describing the research of the majority of university/college scientists as 'mediocre' or 'pointless' sounds arrogant and offensive. But what we are condemning is the activity and not the persons who perforce have to pursue it. It is a colossal waste of highly skilled manpower. Mind you, university science teachers are all very intelligent, talented individuals. By subscribing to the prevailing ethos of defining their worth only through published research they condemn themselves, by that standard, to remaining forever as second-class citizens in the community of scientists, instead of holding their heads high as top-quality academics.

It is true that doing some research can enable a university professor to be a better teacher. A teacher who has gotten his/her hands dirty with recalcitrant equipment or messy calculations can better communicate to students the important role of innovation, trial and error in science. However, the 5–6 years of their Ph D research exposure should suffice for this purpose. Continuing to do 'more' research year after year, usually in the same narrow sub-area does not make him/her a better teacher.

I am *not* objecting to university scientists voluntarily doing research throughout their careers. That is different

from pressurizing everyone to do research, using *Saama, Daana, Bheda* and *Danda*. Any university teacher who wants to pursue research, *of whatever quality*, should be free to do so and be supported by their parent institutions as much as the funds and infrastructure would allow. If that support is not sufficient, the scientist should be given fair and equitable access to grants from funding agencies like DST, DBT, CSIR, etc. This happens even now and we have no complaints on that front.

However, there should be no formal incentives to university teachers for doing research, such as faster promotions or salary increments. If a university scientist publishes very good research papers, he/she will win the respect and admiration of colleagues in the larger scientific community anyway. That used to be considered the highest of rewards and the academic community should revert to those values. As a corollary, the entrepreneurial side of research should not be accorded undue respect in a university. 'Pulling in' more grant money, hiring more assistants or occupying more real estate should be taken for what they are – essential amenities needed for that person's research, but not a reflection of its quality.

Not many university scientists may choose to pursue research if career incentives are taken out of it. That would be fine, as long as they contributed in other ways to earn their salary. We do not suggest that they be made to teach more courses. Rather, they could strengthen the quality and intensity of the teaching programme by learning about new developments and disseminating them. They could organize more seminars, give tutorials with in-depth elucidation of course-material, design more challenging take-home assignments and examinations, etc. By thus reinstating the importance of rigour and scholarship in science, universities can eventually wrest back their traditional primacy as providers of the best environment for scientific activity.

The primary responsibility for this of course lies with the universities themselves. But, for the same reasons we outlined earlier, the university leadership and the UGC seem to have far less impact on science policies than Institute scientists. Therefore, ironically, we have to look to our colleagues at Institutes, who play leadership roles in Governmental committees and Science Academies, to recognize and repair the damage being done to university science. Paying lip service to the problem is not sufficient, particularly if steps are meanwhile taken that, however unintentionally, end up hurting universities further.

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