

bers, is to go abroad for a year or two, imbibe what the foreigners do and, on return, keep working in the same field. Again, this does not result in exciting research, as prospective students see. What all this means is that senior researchers generally fail to provide leadership for junior faculty members to get started in a way that will lead to truly exciting research on a world scale. Efforts should be increased to seek worthwhile research problems in fields of concern in the Indian economy. Suitable problems can capture the interest of postgraduate engineering students. For science students, what matters is 'frontline, world-level research' that, unfortunately, is not necessarily or readily available in any institution in India.

'Project work' is now a universally accepted part of the undergraduate curriculum, which also was initiated as a requirement by the IITs. Often publications have come out of undergraduate project work. Nevertheless, project work, as understood in this context, is not research per se. Students, even school students, are enamoured of research. There still is magic in that word. Can that enamouring not be exploited? If undergraduates are involved in research, not only will they be ready for a research career, but also will the funded

research projects benefit. Motivated students tend to learn a lot by self-study, with only a little orientation. At the mid-undergraduate level, research would however be only a part-time involvement.

To summarize:

(i) The record of IITs inspires confidence that they would continue playing their role as hitherto, which is a strong argument to support IITs even more than in earlier times. Elitism does have its values and rewards.

(ii) JEE remains the symbol of 'quality with integrity' of IITs, and should be jealously guarded against administrative and political interference.

(iii) The problem of 'teaching versus research' will remain an enigma, but it is possible to handle it delicately without detriment to either.

(iv) The element of elective courses in undergraduate curricula needs to be enlarged in innovative ways, consistent with world developments.

(v) Involvement of undergraduate students in serious research should be introduced, without upsetting the apple cart too much. The recently much-publicized experience of IIT Kanpur in Computer Science is telling.

(vi) Further discussion is needed to raise the postgraduate image of IITs to world standards. It is a mistake to take the success of postgraduate alumni later elsewhere as a measure of the local research atmosphere.

(vii) The science-engineering dichotomy that has just germinated, needs to be curbed. One way is to strengthen integrated core curricula. Another is to further emphasize interdisciplinary approaches.

1. Balaram, P., *Curr. Sci.*, 2003, **84**, 613–614.

ARAWIND S. PARASNIS^{†,‡}
ROBERT S. GREEN*

[†]Formerly Professor of Physics (1960–89),
F-17 Chaitravan Residency,
127/2 Aundh,
Pune 411 007, India

*Programme Leader (1964–66),
Kanpur Indo-American Programme,
IIT Kanpur

[‡]For correspondence
e-mail: phiroze@vsnl.com

Teaching and research programmes in science in Indian universities

The familiar rush of the faculty and leadership of universities to become sycophants of the regime in power is not so uncommon in our times in India. A number of problems of teaching faculty and relevance or otherwise of science courses, plaguing our universities today, could be attributed to this. Several disturbing reports deal with the decline in the number of students opting for undergraduate courses in basic sciences. There have also been talks of 'private funding' of science education and research in Indian universities by both the University Grants Commission (UGC) as well as the government. While the model of private-funded university seems to have worked and driven first-class research in the American university system to a large extent and in some institutes in Europe, we must ask the following questions: Are Indian universities ready to take up this model? What is the problem with teaching and

research programmes in science in the university system?

Most private enterprises in India, if they were willing to pay the universities for carrying out research, would most likely only fund so-called applied research. Many Indian universities today seem to have abdicated their central mission in a democracy, and turned over decisions on what can be correctly studied, and what is excellent, to political power centres.

In the 1993 UGC's Punnayya committee report there had been a reference to universities earning and contributing to part of their budgets and there was also a mention of increasing the earnings of the universities by 25% in the next ten years. Ten years have passed and there are a few left in the university system who maintain a research profile and effort consistent with this much maligned mission statement of the UGC.

Science departments in most universities have either not reacted to the harsh realities of the fast changing world or are still slumbering under archaic or irrelevant courses and poor infrastructure facilities. Some universities which did wake up to the challenges of globalization and education as a resource-generating means have attempted to start courses in sciences that are competitive and current in their content and are improving their academic infrastructure. However, many science departments have not upgraded their academic programmes and research standards.

Many committed scientists who want to make a difference to science education and research programmes in India, complain that due to lack of either specific goal-oriented science policies or confusion on what should be best funded – basic science or applied work, no sustained effort is taken up by the concerned departments. Many of them mention that

good research is not strategic, applied, basic, mission-oriented, theoretical, experimental or developmental. There is only good or bad research.

By blindly assuming that all applications necessary for development would and should stem from known principles, one is possibly endangering good, original scientific concepts to develop and is possibly sending wrong signals to the younger generation. This is also possibly telling the youth that all science should lead to only making money rather than understanding how nature works. Is it any wonder then that even premier educational institutes like the IITs are worried about the low percentage of students wanting to study and carry out research in basic sciences?

For those of us who have lived through the good times for basic research, we

believe that a university is a community of scholars engaged in teaching and research, and that its essential function is to teach the young in each and every generation to question the science and values of previous generations and, in the process, open new knowledge. This view of our role is now possibly being threatened.

Academics feel that it is self-evident that research is a good thing that ought to be supported, especially fundamental research. But they are mystified by the decline of resources available to do research, especially in basic sciences. Because the new science managers tell us what is right to know and assign what they call human resources in the so-called national interest.

Of course, one should not be too critical and forget the few good investments

that have been made in some of the more prestigious and academically sound universities in India. For the moment we have to accept a situation of declining standards in science education and the number of science graduates passing out of the universities to ludicrous low levels. The main problem that we have to address is how to keep science alive for the following generation and make it attractive so that India may one day produce Nobel laureates in her own soil.

ARUNA DHATHATHREYAN

*Chemical Laboratory,
Central Leather Research Institute,
Adyar,
Chennai 600 020, India
e-mail: adhatha@vsnl.in*

Celebrating mediocrity with entrance examinations

'I myself do not burden my memory with simple facts that can be looked up in textbooks. The true purpose of education is to train the mind to think.'

Albert Einstein

A letter by Gupta¹ on the limited usefulness and relevance of coaching for entrance examinations, made interesting reading. I think the author has only understated the evils associated with the overemphasis on entrance examinations.

While we have a mad rush choking the entrance exam halls, these very exams have also become the most litigious educational issues. Entrance-exam rank lists have been frequently challenged in the courts, especially in Kerala. In July 1999, the Kerala High Court, with the help of an expert committee, came to the conclusion that a staggering 57 questions were defective in a Kerala entrance examination question paper. Of these 57 disputed questions, the committee found wrong questions, questions with more than one correct answer and questions with the wrong answer marked as key.

It is difficult to understand how errors on such a large scale crept into these question papers, because it is easily the most sensational event in the educational calendar of Kerala!

To make things worse, the fiasco occurred again. In a more recent dispute, the Kerala High Court directed the Commis-

sioner of the Entrance Examinations to re-value the papers of the medical/agricultural entrance examinations and recast the rank list. Significantly, this ruling came in the wake of a batch of writ petitions challenging the deletion of 17 defective questions during valuation. So much for the Kerala model!

When the questions are already full of errors, as the courts have repeatedly asserted, how can such examinations be the basis for identifying merit and aptitude? The whole exercise is *prima facie* invalid.

An entrance examination, whatever be its utility and convenience, is myopic because, at its best, it only serves to monitor input rather than output. Ironically, entrance examinations have thus become instruments of social exclusion rather than inclusion. This is antithetical to the very spirit of empowerment.

In a study undertaken in 1974, Dave and Hill² came to the conclusion that examinations in India have become the basis of an 'educational caste system'. To quote a few lines . . . 'A person's standing in the examinations affects many aspects of his life. Not only is it a basis of his economic success, but it also affects his prestige in his [or her] family and his [or her] value in the "marriage market". The examinations thus form the basis of a kind of educational caste system, superimposed on the traditional caste system of the country'.

Examinations, chiefly entrance examinations, have only been deepening social divisions by creating a new class of educated upper castes. Having acquired elite degrees, the recipients often display the same haughtiness that reminds one of the feudal times.

The intemperate focus on multiple-choice questions [the mainstay of most entrance examinations] is so devastating that there is hardly any importance given to grasping the larger picture. Both language skill and language instruction are steadily losing importance in secondary education. The central purpose of coaching centres is to convert questions of reasoning into questions of recall. Having solved a typical model question, thinking is replaced by a memory drill. In other words, the students' creativity and genius are, in one stroke, sacrificed at the altar of entrance examinations. Here is a shoddy system that can potentially jeopardize the future of our country.

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M. K. UNNIKRISHNAN

*College of Pharmaceutical Sciences,
Manipal 576 104, India
e-mail: cheruvaloor@yahoo.com*