

Typically, out of some 12 papers of the same trend, if 8 were taken it became 'general', and if 12 were taken it became 'honours'. The difference in the approach and spirit of the two, which is linked with the difference of objectives, got lost. The result has been that the general student is left high and dry, as also the teacher.

Even worse happened at the higher secondary level. The NCERT, mistaking the best research workers to be also the best teachers and educationists, invited several top elite people to head committees to write the syllabus and text materials. I do not at all cast any doubt on their honesty in such selection. These eminent people accepted the responsibility, and I again do not have the least doubt that they did mean doing good service to the society in all honesty. They are all, in my opinion, men of great honour and competence in their respective fields. What went wrong was that they did not realize that education is a separate field of specialization, requiring different talents than only knowledge of science. Further, they were not prepared to give up their current research involvements, and they left most of the work for others to do. Yet worse was that once the manuscript was handed over by them, they did not have control on the get-up, drawings, conduct of examinations, etc. This cascading series has done very considerable damage to science education in India. One

has only to compare with the effort of an agency like the Physical Sciences Study Committee in the USA to find how very poorly we have come forth in this effort. I mention this in depth because the Academy appears to be entering the same kind of role, in all honesty, of course, but without quite realizing that education is a different field from research.

Let me repeat that I have the highest respect for the Fellows of the Academy for their contributions to research. I also have the confidence that the proposal they have come up with springs from the bottom of their heart. They really mean to help education in science. In that context, I have a few suggestions to make:

(a) Let them not start a new journal in science, but send their articles and suggestions for improvement in science education to the existing journals. Their frequency can be increased; their volume per issue can also be increased. In fact, even their format can be altered. I am sure the Editors of the current journals will be only too happy to have many of the contributors on their Board of Editors.

(b) Let them use the channels of the UGC subject Panels to initiate new ideas and proposals, rather than create a new power centre of their own. Let them also use subjectwise teachers' organizations as means of executing their pro-

grammes. For physics, from IAPT, with over 3000 members spread uniformly all over India, and with its sustained work over 10 years, they can feel sure of all cooperation.

(c) Let us discuss in depth why physics is losing all interest and excitement as a subject to be learnt. In particular, the laboratory component needs to be examined in depth. (But it cannot be a casual matter.)

(d) Let them involve leading teachers from the universities (as distinct from leading researchers only) in whatever they want to do for the advancement of science education.

(e) Let the very idea of creating elite centres for elite students be shelved deep, and let us work for the uplift of the largest masses through dedicated teachers' efforts. The processes of examination, selection of candidates as also the institutions, and the selection of teachers, etc., are all fraught with great danger. They may lead to more fragmentation in the society, and particularly the teachers.

I appreciate the initiative taken by the Academy. The purpose of this correspondence is to get the best out of such a powerful initiative.

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OPINION

The Indian Academy of Sciences document on science education in universities: A criticism

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I was dismayed when I read the action plan of the Academy for science education in Universities. It is necessary to assess what the Academy proposes *vis-à-vis* what its predecessors have done. The document rightly refers to the Kothari Commission, a large tract that bemoans the state of education even as it stipulates what needs to be done. The

Academy document, more prosaic, more clinical and consequently less transparent of its own shortcomings, has no insights. If it has, these are suppressed very successfully¹.

There are three players in the educational scene: the teachers, the students and, most importantly, their homes. Each of these has undergone a sea

change in the last few decades the world over. The document reflects neither their magnitude nor the implications. Most importantly, the document offers no justification as to why science education has to be given specific preference. It has some marginal statistics, as a matter of numbers. The reasons behind the numbers are anybody's guess. If

students are not taking up science, what are the reasons? If they are taking up science and not doing well, what are the reasons? Instead of going into a factual analysis of what is the situation, the document considers the simple-minded scenario: put in money where the students are good, the results are bound to improve. A number of instances are cited as patent successes such as the Maths Programme and the Biotechnology Programme. The document does not reflect any of the existential concerns that affect these so-called successful programmes.

So the major concern is money. This country has developed two major arguments in defence of its failures: first that there is never enough money and the second that there is too much population. Education and science are no exception. Good conscience for a scientist, for a Head, for a Vice Chancellor is to get money. Many of our mind-sets are based on expensive fallacies, which are more important to understand than what the Academy has to offer. Let me briefly outline these.

Fallacy of money

Give better wages to teachers and teaching improves. It did not. Easy research money also will not improve research. In an excellent evaluation of an Indian university in an anthropological study, Don Kurtz wrote of how majority of the rural and a great deal of urban teachers are busy with parallel occupations so engrossing that their teaching is a mere avocation. The shocking thing about the university teacher is not that he attends to other jobs. A good many do not. Majority spend their time vacuously without any yardstick of achievement except routine teaching. Someone should do elapsed time analysis of a university teacher (this is more difficult to assess in National laboratories, where timings are adhered to but there is no rule that one should work!). This easy style of living is reflected in the low level of maintenance of buildings and rooms.

It is a sad mistake to imagine that one is complaining about all these. Actually it is a very comfortable situation. There is total lack of accountability. Good manners and departmental *esprit de corps* see to it that no one is challenged. Administration is usually very accommodating. Each faculty member has enough reasons of committees of vari-

ous kinds, politics, harassment and what not to prevent him from teaching or doing research².

Fallacy of perfectionism

This is the major bug bear of Indian educational system. I think that it is time we realize that a great deal of standard teaching requires plain donkey work. If it takes donkey work to teach at the lower levels *en masse*, then either we should be prepared to do donkey work for majority of the time or we should not be ashamed to appoint donkeys to do that. This is what work ethic is all about. Kothari wrote about the requirement for a university teacher. He wrote, in a sense correctly, that a one-hour lecture should require 3-4 hours worth of library and assignment work by the student. That is not easy! If I have to give a *thinking* lecture, original in content (as opposed to an information-laden lecture), based on what I know, without much preparation, I have at most about 5-8 lectures to give per year! Otherwise, I have to resort to existing problems in books or reading assignments to make them work.

If we consider science of today as perfect science, we already lost the battle. We would teach science as a finished polished perfect thing. It loses all the uncertainties, imperfections, grey-ness of the most exciting part of science, i.e. the developing science. The most damaging aspect of education is that most teachers take the finished aspect of science as gospel truth and consider their job primarily one of giving information. Science cannot be taught without doing it. Alas, it also cannot be done without sharing it. This was why most argued that the universities should be the places for research, a mould we have thoroughly destroyed in this country.

It is not that there are no problems. If we teach science as the grey imperfect thing that it is, we lose most of our audience. A sustained effort at teaching the method of science to M Sc Biotechnology students over 5-6 years convinced me of the futility of it to get it revoked from the syllabus! It is not possible to teach something in isolation when it is not shared by bulk of other teachers.

Fallacy of merit³

This country started IITs with the hope that if we take the best and put them

where they do better, everything will be alright. What have they done after IITs? If intelligent people need to be doing science, why is it that so few of our brethren in IITs have impressed these growing and glowing minds towards fashions and passions of science and research? Why do many opt for the Citibank? The students who get into IITs by grind do so under a number of compulsions, parental pressure being the most, peer pressure the next. An individual's choice for a subject is dictated not by active interest but by the current mores and the order of merit. Merit does not seek personal involvement. What has recognition of merit led to? The evidence is clear that any recognition leads only to easy life. So does lack of recognition, which blunts ambition. What we fail to see is that by sequestering them into a privileged community, we have raised their expectations without a provision for integration.

Fallacy of preaching

Most of us think that since we are doing science, what we are doing interests our students. There is also this law of diminishing returns in science. If you have done science, if it is the best thing for you, so be it. If an area has rewarded you, it need not interest the discerning youngster. The student wishes to examine his returns. Secondly, he wishes to know if you work (\cong succeed).

Since most do not work by themselves in the absence of students and assistants, and many do not work regardless of students or assistants, the question of science in this country is limited to what can be done by way of PhD programmes, which are primarily remote-control operations. We are talking about a very inexperienced work force, whose life is limited to 4-5 years, of which 70-80% is lost at the formative period and hardly 10-20% of the professional life goes into research. If we consider countries with much lesser number of people, they have achieved much more. The difference is not in overall numbers but in working numbers. We have the least of the latter. These cannot enthuse the newer entries towards anything other than a retired life.

Fallacy of rewards

Any reward system that is not heavily backed by peer pressure is a disincen-

tive rather than incentive. Scientists would be no more than dictators of tinpot republics displaying rows of medals that were not won in any battle and were largely self-endowed. Even then, the real danger is not in the awards but in the deliberate creation of pecking orders. Lack of authenticity, the main plague of Indian science, leads to many alternate means to develop science and education, all of which are doomed to fail and they have. The best of the Indian institutions are imitative. In the absence of originality, and even more, authenticity, where does excellence come from?

There is something about the past and present in the Indian scene of science and education that is worth pondering over. The key word is authenticity. I refer first to the Kothari Commission and then to the psychology of the modern student.

Fallacy of degradation

One discovers corruption and degradation as part of the middle-age crisis. Is our science deteriorating? Or is the middle-age science deteriorating⁴? I would strongly recommend a reading of Cicero to anyone who talks of contemporariness of corruption and degradation.

When we are younger, we do see that things are not going too well. Being younger and optimistic, we let things be and get busy with whatever we can do. We soon run out of time. The crisis of middle age is when we are running out of new things to do and running even more out of the time available to us to find new things to do. A clear case of burnt out options! When we find that time is finally getting the better of us, the illusions fast disappear and we despair of the things that would never be. How well does the government recognize science? How about a new NRI university? We forget that we represent a constituency and a trade union and we forget that we have vested interests and we also conveniently forget that we have larger responsibilities. Relevant work in this country is shunned since it involves commitment. Why do we blame our politicians for monopolizing the public interest? Do we share any? It is possible to live with all these imperfections among ourselves. But the instant we arrogate ourselves to the keepers of conscience, we certainly have

gone into a severe level of delusion. Too many of us sit on too many committees too often as yesmen. We not only achieve little but also allow things to slide far. Kothari was deeply worried about this docileness, this lack of comprehension of larger scheme of things, this apathy and cynicism and the lack of ability to challenge the purpose.

Kothari's forgotten plea

The conceptualization of a modern Indian university in the Western mould was literally a thought in the wilderness. It was stated that universities control colleges that are not even in the same province. It was contrasted with Oxford and Cambridge and the British thought that one day these problems would disappear when colleges do not depend on remote control by distant universities.

The UGC came into being and a lot of universities followed. All of it was inevitable and did not worry Kothari. One thing worried him most. It was the independence of thought. He was deeply concerned about the fearlessness of the Indian teacher. In fact, this is among the few personalized and important topics that he devoted most attention to.

Obviously, what Kothari was worried most about was the lack of individuality in the teaching community in this country, because that is what he wrote about. He eloquently asked for it since this is what we did not, do not and will not have. We actually confess this gently all the time. When we say that we have failed to develop adequate peer review structure in the country, do we not mean that we have become mercenaries, with no love except for our own gains? We at least admit our lack of honesty of purpose.

I take it that sycophancy was what worried Kothari most. The British loved it. The colonial India had its ethical roots in Rudyard Kipling and sycophancy⁵. Independent thought was possible. Fearlessness was most definitely not⁶.

Kothari's errors

The Kothari report wielded considerable influence. We had MPhil degrees as a further stepping stone between Masters and PhD. There was this pervading mind-set that, in order to do something new and original, it requires proper

preparation and that this preparation can be imparted by the wise and holy. It is now common knowledge that even a Masters degree is a waste of time if the B Sc is okay. The way to learn to swim is to start swimming and not prepare lecture notes on swimming. So also in research. What do we find about MPhils? These are either clocking time to go abroad or get married or indecisively waiting for better opportunities like MBA or IAS. The right approach to research is to get going and not to prepare for it.

The second error of Kothari was in that he romantically believed that production of some high-powered, expensive structures for education for the meritorious would enhance the capabilities and the nation would benefit. Yes and no. This class of problems has at best a percolative effect. This contributed more to the baseline than to the top performers. Nation building requires a lot of chores that may not have much market value. For instance, who would go to regional colleges to teach? When the USA stopped the preferential import of engineers, a lot of them stayed back and now we have some PhD's teaching in colleges, which was never the case. Other than a marginal percolation, have these edifices contributed significantly (considering the money poured in) to the growth⁷? The error is not in asking for merit-oriented establishments of high cost and fidelity in performance. The error is in assuming that such structures would be possible in a time-lasting manner and that the results would be independent of the social circumstances and market forces. The kids who study there come from families and families have aspirations. The question is, do they match?

The major problem lies in the romantic notion of merit. Merit yields results (for the individual) and results lead to power. The shortcut is that let merit be assumed and not won. We have only tenured positions. Who cares whether a qualified person does not work or an unqualified person does not work. The end result is the same. Universities have offered us exactly this. This heady brew of nonperformance. There is no academic audit in any university. What is in question is not merit but the attitude to the job at hand. Merit does not ensure that and, therefore, it is not a sufficient condition for performance. We have not evolved a system that ensures merit as well as attitude.

The market force logic

When we were young (I grew up in a University Campus), everyone told us that it would be good to take up a professional course since jobs are easier to get and assured income is what life is all about. While that may well be, the academics were also seen to be doing things on their own and appeared to be equally comfortable. While emphasizing the material things, there was a simultaneous de-emphasizing of their primacy in life, we have not heard in schools and colleges anything other than that education is everything and everything else is of less worth. A mind-set that persisted by frequent repetition. The market force was always there⁸. Only, it was not put on a pedestal like now. The best always exploited the best of the market since they are both savvy and have highly developed manipulative skills (as any teacher would know). By de-emphasizing the market forces, the second best, though with higher motivation, got into education and related areas, including government jobs. Now the industry, which is still considered second-rate in the country, is picking up these people vigorously. So enrolment in science will plummet further since new markets are opening up for them. How many are taking language and philosophy? Do we need any lesser brains in these areas, however few may be required?

What do we do today? In biotechnology, we are supposed to encourage students to go to industry. Since we speak of industry, the students ask whether they can have the cake and eat it too. Can they finish the Ph D while working for an industry and so on. Amazingly, few students think beyond the self-reference that they owe something to the industry that is going to pay for their upkeep. The Indian student is brought up in such a sheltered manner that no one told him that there are no free lunches in the free market economy. Little emperors!

Whatever we do for Indian science, elitist attitude will destroy performance. It takes away opportunities from those who need it most and fritter it away on those who have the least commitment, statistically speaking. Science and knowledge are based on performance. Merit is based on promise. These are not the same thing. Power is based on actualization by simply being there i.e. where it counts. Merit and performance

are routes to power. Neither individually nor both together are sufficient conditions for acquiring power. Amongst the proxy routes is what we call nepotism, a word we reserve for the individual. When a group is involved, we call it social action and equal opportunities employment. There is no point in getting our hackles raised. All these explicitly recognize that being there is what matters in society and, therefore, in the absence of critical performance criteria, everybody will insist on equal opportunity to get there.

Teachers, the romantic diehards

Pune University has an interesting experience, since it housed till recently zoology and biotechnology in the same department, the former by local merit and the latter by national selection. As an insider, I tried to evaluate what motivates the teachers the most. The biotechnology students represent, on an average, a more cosmopolitan cross-section and perform better. However, one needs to listen to the teachers about their attitudes to these students. The university teachers, unlike the guest lecturers from national laboratories, react differently. First of all they complain often that these students are less sincere and more arrogant. When the same complaint comes too often from even the better teachers, one worries. What I saw was an amazingly simple matter in academic psychology. The faculty claim that while a lot of teaching is drudgery, the tedium is made up by the few students who perform very well. The usual university students tend to be of uniformly lower level, barring these occasional performers, and their motivation also tends to be uniform. In this low-average class of performance, the occasional good student could bring tears to the eyes. Of course, it is not as simple as that. Actually many of them are exceptionally nice kids, often very sweet and most polite. They are quite diffident and yet when handled gently can be motivated to a higher level than one would consider it possible. On the other hand, the biotech students are, on an average, better in their intelligence, with less of an excuse for goofing, which makes the teachers mad. More than 50% of them have no interest in what they do once the novelty of Pune life wears off. Thus, we see better per-

formers with a higher level of variance in their motivation and performance among the biotechs. It is definitely more painful to see a better student being a nonperformer than a lesser student. Since such a possibility arises more in biotechnology than in zoology, the attitudes of the teachers too have shown variable level of weathering towards these students. Better students breed cynicism faster in teachers than lesser students. The culprit is the variance in attitudes at constant capability! This was confirmed by some IIT faculty as well in personal discussions.

We have occasional departments in the universities with considerably better cross-section of teachers, at least on an average. The student inputs are no better. However, the teachers generally do not innovate in teaching simply because this is a bother. That is what worried Kothari. This oppressive (conventional) wisdom that aborts action even before it is contemplated!

The psychology of nonperformers

In the final analysis we need to contend with nonperformers. Lack of intelligence does not correlate well with nonperformers any more than intelligence assures performance. The key factor is the attitude. What drives people to non-performance? Are they made or are they bred?

We cry a lot about changing values and loss of traditional modes of living for all the wrong reasons. In the larger joint families, the average attention on a single child is negligible. There are so many. Largely the children look after themselves with marginal contact with adults. What happens now? With the increase in nuclear families, the child (we two and ours two!) now has two pairs of grandparents and one set of parents who dote on the single or the well-spaced two children. The parents, both working, come home with a heavy guilt feeling that they are neglecting the children. This view is heavily reinforced by the ageing grandparents, whose justification for hanging around is that they are needed to fortify (or disable?) the minds of the younger with their notions (when we were younger, we rarely spoke to the elders and, fortunately, they spoke to us even more rarely) since the parents are neglecting the children. The guilt complexes lead to overindul-

gence of the children. Thus, little emperors are born. Once born and bred, they stay! China is reeling under the impact of these little emperors. I have interviewed a large number of students now. I have no doubt that we have our own growing numbers of little emperors.

We have been devoid of performance in this country for a long time. There must be deep-seated reasons here for this. Individual excuses or else a social reason like population or caste cannot be made responsible for it. *We need to consider it a matter of highest priority as to what makes our youngsters untick. We need to determine the behavioural strategies we adopt with great care as parents, teachers, grandparents, or what have you, that rob the children of their initiative.* There are many things that we do not know about our youngsters. Most of all we do not know how much of insecurity is critical and undamaging to the youngsters to ensure their performance. We need to consider even their social mores, driving force for smoking to harder habit like drugs, AIDS etc. Unfortunately, there are few meaningful studies on a cross-section of people that represent tomorrow.

What we require is a professional psychological survey aimed at the performers and the nonperformers. In spite of the fact that I believe that I have seen a reasonably large sample of semi-performers (as in biotechnology as well as in IITs and so on), I feel it is very prudent to have some assessment of what is going on. We need thumb nail sketches of what the parents think. We need to know what made the students opt for what they did. Above all, we have to examine why the Indian science student has delayed social puberty. I have seen several students react to their first time out-of-home atmosphere as if there is no tomorrow for catching up with all the lost time. We have social dimensions and problems of a large kind that determine the behaviour of the youngsters.

This is where the notion of perfectionism hurts. Science is perhaps the only avenue in academic life in which a mediocre person can do well. Arts and humanities are brutal. To do well you have to be very good indeed. Instead of emphasizing performance that we should, we emphasize promise. There is no other way to understand the Academy document. Performance requires motivation and motivation is in the

realm of psychology, an aspect of human beings that the Academy was deafeningly silent about.

The approach of the Academy is not without blinkers. First we have those who take up science because they have not been pushed enough to get into competitive exams. Then we worry about their future since we find the options diminishing. A lot of ideas get generated: NRI universities, new initiatives for science and so on. In all this we ensure the basic attitude that spending money is good enough.

The action programme by the Academy: How justified is the fund allocation?

The Academy followed up the recommendations of the Planning Commission and suggested spending some 25 crores on the gifted, 60 crores on the less gifted and another 30 crores on the rest. At the face value, it looks reasonable. Have another look and you would be horrified (Figure 1). The numbers look alright grossly. The Academy is suggesting spending some Rs. 15,000 per capita on some 700 students of the tier I per year, some Rs. 1000 per capita on some 25,000 students of the tier II and some Rs. 100 per capita on some 1,23,000 students – the rest. These being 1989 figures, an upward revision of some 5–8-fold would be in order. I have no doubt that there is no ill will and the recommendations were made with the best of intentions. But then, good intentions are what they are. Where do they lead us? On the one hand, we are talking about 60 crores (tier II) of the same level of incomplete education, while we are offering 30 crores of placebo as a political gimmick to concentrate 25 crores on the (?) desirables. We are talking about, with a straight face, creating a yet another group of not-so-little emperors who will also become self-seeking snobs. They would also be alienated and subservient to all that is Western, with a goal no more than to dwell on a postdoctoral fellowship abroad. For a few more dollars! Yes, Kothari had a justification then. The performance outcome of higher citadels of learning towards science education, or even education in general, was not understood then. The age of innocence may be forgiven. Yet we are talking about reinforcing majority of these 'failures' (the Academy was also clear

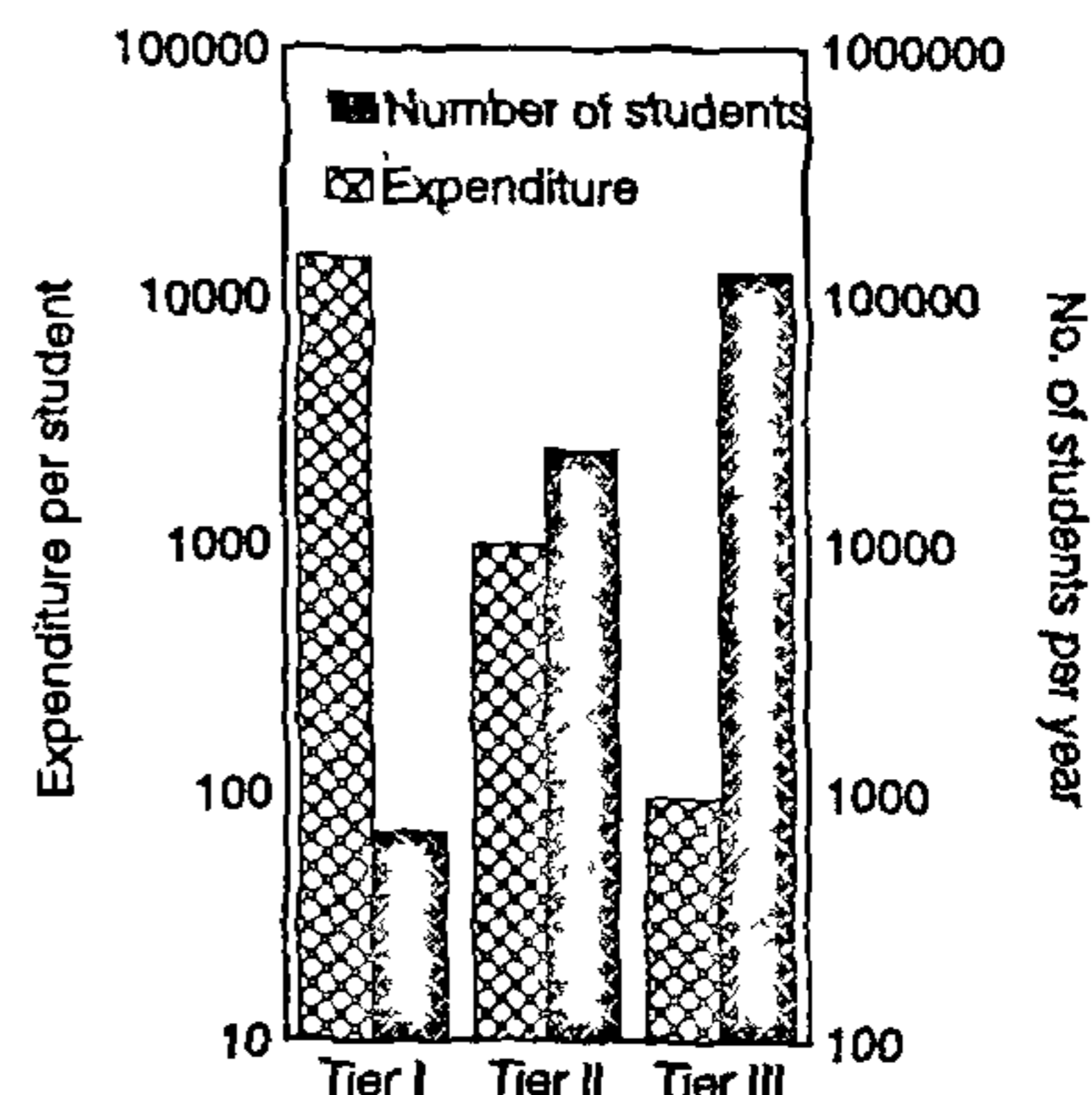


Figure 1.

that these were rejects of an earlier selection process) with a system of education so far removed from their own brethren and for which they have done mighty little to earn.

When they graduate, their expectations will be very high. We have been fighting a losing battle with the biotech students and their attitudes, of levity and lack of sense of proportion. We created an artificial market. It was not bad, insofar as the pressure was kept high on them and they were made to work, such that even routine practicals ran past midnight. When relaxation has set in due to inadequate induction of new faculty, and the change in attitudes with time, we find that even their CSIR-UGC scores have begun to dip. What the Department of Biotechnology has done is losing an excellent initiative, and not help setting the norms. Universities have their own momentum for the inevitable downward slide and oblivion for any programme.

What should the Academy do?

The intelligentsia in this country can achieve more for this country, if they display greater humility. If not, we have these recurring and persistent images of Don Quixotes running at wind mills.

I think that the Academy should continue to promote debate and help provoke people. It certainly provoked me into writing this, possibly much against better judgement. It should have definite and tangible goals that help ideas and proposals for school education, videos, etc. It should also learn from the

existing experience in media management. It is time we analyse and tell the UGC how poor many programmes on the countrywide classroom are. The Academy should primarily help motivate any and all programmes that are based on individual initiative.

Above all, the Academy should stop worrying about excellent science and start worrying about existing science and the existing practitioners. Existing problems are there only because the available solutions do not work. A recurrent problem often requires a drastic change in the mind-set. The Academy also should stop worrying about NSUs. We have built many edifices. There will be more. If we are more worried only about losing the piece of cake, we will have no moral justification for the stand we take. Is all the UGC money going to teaching departments and to equip them better? Have major chunks gone elsewhere?

Is there a definitive, prospective course of action urgently required? Yes, I believe that it is time we get the educational system examined by professionals, including sociologists and psychologists. What we need most is painstaking definition of standards in all that we do and the minimum that we can tolerate. *It is the minimum and only the minimum that we need to define.* The government will not help here since it caters to a different constituency. Only we can help ourselves. Above all, it should also help develop standards for rating performances at all levels. Armed with appropriate surveys and relevant analyses, such an effort may bring out some clarity on where to focus our efforts for maximum results. Another area is to begin a serious exercise in cost-benefit analysis and a realistic appraisal of minimum funding for all universities for given courses. The newly started National Assessment and Accreditation Council has aspirations and plans in this

direction, which would require considerable help from the academic community.

Centralization of education was inherent to the Academy's idea of picking a few as the best students in science. It has its evils and is even nontangible due to the displacements involved. A larger goal may be to take higher education out of concurrent list, if we have to survive the competition following liberalization, since we simply have to do better. In any event, the solutions run deeper than realized in the Academy document. It is time we shed the proven unsuccessful paths and exercise the same quality of vision that we envisage for the future students.

Notes

1. Peter Medawar in his *Advice to a Young Scientist* remarked that there have been two preceding instances wherein an advice to the younger was attempted. One is Polonius' advice to his son in *Hamlet*, that gives the basics of noninvolvement... 'neither a borrower nor a lender be'. A later effort was Lord Chesterfield's advice to his son, which, aptly summarized, taught his son the behaviour of a courtier and the morals of a whore. In attempting to advise the younger, it was necessary for Medawar to steer clear of the shortcomings of his illustrious predecessors. So he came up with a book that tells you how to excel in science if you are already born with a silver spoon in your mouth!

2. The Academy wrote of conveying the excitement of science to young minds. Pooh! In a class of 100 students or more, teaching the same topic for over 25 years, what excitement does one convey and to whom? Even if one starts well, how long will he sustain?

3. 'I am profoundly suspicious of the "A" man. He can say back what you want to hear in an examination, and'... 'you must give him his "A" if he says it back, but the ability not to say the willingness to give you back what is expected of him argues a certain shallowness and superficiality. Your "B"

man may be muddle-headed but muddle-headedness is a condition precedent to independent thought... ' A. N. Whitehead, *The Dialogues*

4. Or is that since Fellows of Academy come into being in their middle age, there is a coincidence in the way things are perceived to be wrong?

5. Ramanujan was the ultimate example of colonial legacy. The moral of Ramanujan is not that Indian genius exists. The moral is that the only salvation for the Indian scientist is International science, where he will have a better and fairer chance than in the Indian scene.

6. This is a tradition that is not lost to this date. Rotation of headship (of a department) does not matter. Having spent nearly a decade in a university, I realize that it is merely of rotation of one to whom obsequiousness must be tendered to. A well-practised ploy to a countryman to whom polytheism is deeply enshrined in the heart.

7. It is time someone does a cost-benefit analysis of educational structures the same way as we have done for dams. Taken the overall scenario, the cost-benefit analysis showed that development is not without cost. The cost-benefit analysis should take into account the cost of diverting money and personnel from the educational system and the effects on the dilution that ensued.

8. 'I do not believe that the modern parent of any class is more mercenary than his predecessors. When classics was the road to advancement, classics was the popular subject for study. Opportunity has now shifted its location, and classics is in danger. Was it not Aristotle who said that a good income was a desirable adjunct to an intellectual life? I wonder how Aristotle as a parent would have struck a headmaster of our great public schools. From my slight knowledge of Aristotle, I suspect that there would have been an argument, and that Aristotle would have got the best of it' A. N. Whitehead, in *The Aims of Education*

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SCIENTIFIC CORRESPONDENCE

Development of cultured tomato anther to a fruit-like structure accompanied by *in vitro* ripening

With a view to regenerate haploid plants of tomato, anthers carrying microspores at uninucleate stage (buds of 8-10 mm)

from glasshouse-grown plants of cv. Arka Saurabh were cultured *in vitro*. The medium comprised Murashige and

Skoog¹ inorganic and organic constituents, 3% sucrose and 0.25% gelrite (pH 5.8). Factorial combinations of kinetin