Let us do justice to science

What should be the standard of a Ph D degree? What kind of students should be admitted into this programme? What kind of teachers should act as supervisor/guide? What kind of persons should act as examiners? What kind of evaluation should be adopted? What kind of research papers should be published? What kind of problems should be chosen? Why does a Ph D scholar from one institution differ markedly from another from a different institution in terms of his/her abilities to think and tackle a problem independently? Is there any check point for preventing an imbalance in the production of Ph D scholars and scientific progress? These are some of the questions which I ask myself whenever I see the poor performance of students after getting the Ph D degree. These questions have led me to think about the reasons for the failure and the ways for uprooting these drawbacks from our system in India.

In my view, supervisors (guides) and students share the responsibility for the quality of a Ph D programme. Both are linked in the following manner

Guide ← Ideas/methodology → Student
Student ← Results/discussion → Guide

Both share in one way or the other in developing ideas, methodology, results and discussions to get the final picture of results. The best results can be obtained if there is free communication between them on these matters. Therefore, it seems necessary to discuss the qualities of each independently.

Supervisor/guide

A good teacher may or may not be a good supervisor. Research and education are the two wheels of a bicycle. However, the strategies to upgrade teaching and research are different. It therefore, seems to be important that a selection procedure should be adopted for teachers who can also hold the responsibility to guide students. All teachers in the universities are not bound to do research. However, research is helpful in the career promotion of teachers. We can categorize teachers into three classes: (i) those who are good teachers but are not involved in research; (ii) those who teach and guide students at moderate level; (iii) those who actively participate in research and teaching, being more enthusiastic in research than teaching. Teachers (involved in research) do not concentrate on their teaching because there is no reward for good teaching and for professional promotion research pays. Only some students will shower regard and praise on your teaching throughout your lifetime. This is not sufficient boost for teachers. The second category (of teachers described above) is dangerous since they lack the guiding attitude. Teachers should ask themselves: Are we doing justice to science? Or simply asking the students to duplicate the subject (repeat work) for our own interest. Is it good science? Such phenomena are quite common in India. For example, if there is a thesis on the purification and properties of a compound, someone is duplicating the whole study by simply carrying out the same procedure in another species. This kind of duplication is not encouraged at international level unless and until there is a specific reason for it. Why do we do this? The answer is simple. Firstly, this is very simple to do. Secondly, teachers are least concerned with this kind of research because by simply following the methodology of one thesis, they can collect the data from other species.

Therefore evaluation of papers is also important for selection of a guide.
4. Does he/she have motivation towards science?
5. Does he/she spend eight to ten hours daily in the laboratory?

Students

Research is usually the last option to be considered by many students. The priorities are for professional courses. Those who are not selected in these courses take biochemistry as the major subject in their studies. Society also gives less credit to Ph D scholars compared to administrative job holders. This probably reflects the majority of uneducated persons in the society. These people talk in terms of money and administrative power. That is why they pay regard to MBBS doctors, engineers and administrators. Research, being handicapped on both platforms is always disliked by these people. Thus, the last option for them is research because there is no check point in their admission. A few students genuinely like science. However, the majority of research students consists of students who have been unsuccessful in getting admission into professional courses. They have already lost the hope of getting higher position in the society. Therefore, students can be categorized into three groups.

1. Those who have chosen research as a career. This category is best for healthy research.
2. Those who have only a moderate interest in obtaining a research degree for a job.
3. Those who have failed in getting admission to any professional courses. They do not have enthusiasm. Except for a few universities/institutions in India, there is no entrance examination for Ph D courses. Therefore, gates are open for these students. Later on these students become a liability to the teachers/departments.

Things to be considered for selection of supervisors/guides in the universities/institutions

Following are points that should be considered during selection of guides.

1. Is a person qualified enough to guide Ph D students?
2. Has he/she proved his/her ability to tackle a research problem independently? This can be judged from the independent research publications after Ph D programme.
3. Does he/she have publications in peer-reviewed journals (having high impact factor) to his/her credit?
consideration the previous academic record. A research project at M Sc level can prove to be the most important criterion for selection. This can give the feedback that they can do research, not write examination papers. The admission should be provisional for one year during which the committee should be able to evaluate the aptitude of the student for research. If found unsuitable, they should be expelled. In some institutions (like Centre for Cellular & Molecular Biology, Hyderabad; Indian Institute of Science, Bangalore; Tata Institute of Fundamental Research, Bangalore & Mumbai; Bhabha Atomic Research Centre, Mumbai; National Institute of Immunology, New Delhi; All India Institute of Medical Sciences, New Delhi), this practice is followed. The result of such practice is that the scientific growth in these institutions is very high.

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Malaria/mosquito management: A need to use more than one insecticide alternately

Malaria is emerging as a major public health problem in India, especially in forest fringe foothills areas in the northeastern states, Madhya Pradesh, etc.

A report indicates that different agencies like the Malaria Research Centre of the Indian Council of Medical Research have field tested the ‘insecticide-impregnated nets’ popularly known as medicated nets with deltamethrin (2.5% flow) during 1988–90. Over a period of 2 years, there was a noticeable decline in the number of Plasmodium falciparum and malarial incidence decreased by 70%. Also there was a decline in the vector density.

Based on the success of these results, 1,00,000 mosquito nets treated with deltamethrin were distributed free of charge in the malaria-ridden villages of seven sister states by the Government of India in 1996 and many more were demanded by other people in 1996.

Review of literature reveals that many insects, fungi and bacteria have developed resistance against insecticides, fungicides and antibiotics due to continuous use of the same chemicals and now their population is beyond control. The human malarial parasite P. falciparum has already developed resistance against the drug chloroquine. The malarial vector–mosquito has developed resistance to DDT.

From the reports mentioned earlier, it seems that perhaps deltamethrin is the only insecticide being used on a large scale in India at present. If the same practice is continued further, it is possible that within a short period of time, the present population of mosquito will develop resistance to deltamethrin also.

To avoid/delay this chemical resistance problem, it is high time 2 to 3 insecticides are used alternately in the same locality. The concerned health agencies should take note of this.


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DPT and poliomyelitis in developing countries

The write up by T. Jacob John on ‘DPT and poliomyelitis in developing countries’ (Curr. Sci., 1998, 74, 185–187) was very thought provoking. First let me congratulate John for this very lucid enumeration of facts, once more highlighting the ill-informed and callous decision-making process in our Health Ministry, to which I had alluded to earlier. I would also like to confirm, if any confirmation was needed, that for nearly three decades objective scientific data accumulated by Indian scientists, among whom John was a major contributor, has been systematically and arbitrarily discarded under the influence of outsiders, without even bothering to have its independent evaluation by other knowledgeable persons prior to rejecting it.

As questioned by John, even today let there be an independent enquiry as to why MOIFW jettisoned the Indo-French collaboration in spite of objections from the Department of Biotechnology, which was the nodal agency involved in the project. Responsibility must be fixed for the wasted financial resources, the damage to the international scientific collaboration and above all the untold misery caused to thousands of children and their families. I am aware that at that time a suggestion made by some of us to hold a national debate or at least a detailed scientific discussion on the subject fell on deaf ears.

Without casting aspersions on WHO, I fully agree with Jacob that ‘policies made in Geneva are not always technically the best suited for our needs or circumstances, nor necessarily in our best interests’. On the basis of several examples I had recently attempted to illustrate ‘Different ethnic populations, different genetic make-up and