Language of scientific discourse

Every developed country, be it Japan, Germany or France has made its language of scientific discourse the same as that of the mother tongue of the people. A study of the educational history of these nations also shows that at some point of time in their history they made a conscious decision in favour of the mother tongue. The Indian Education Commission[1] under the Chairmanship of D. S. Kothari, then Chairman of UGC, in its report observed that the use of the mother tongue 'can make scientific and technical knowledge more easily accessible to the people and thus help not only in the progress of industrialization but also in the wider dissemination of science and scientific outlook'. Making a plea for adopting the mother tongue as the medium of education in schools and colleges, the report also quoted Rabindra Nath Tagores's Convocation address at the Calcutta University as follows:

'In no country in the world except India, is to be seen this divorce of the language of education from the language of the pupil. Full hundred years have not elapsed since Japan took its initiation into Western culture. At the outset she had to take recourse to textbooks written in foreign languages, but from the very first, her objective had been to arrive at the stage of ranging freely over the subjects of study in the language of the country. It was because Japan had recognized the need of such studies, not as an ornament for a select section of her citizens, but for giving power and culture to all of them, that she deemed it to be of prime importance to make them universally available to her people. And in this effort of Japan to gain proficiency in the Western arts and sciences, which was to give her the means of self-defence against the predatory cupidity of foreign powers, to qualify her to take an honoured place in the comity of nations, no trouble or expense was spared. Least of all was there the miserly folly of keeping such learning out of easy reach, within the confines of a foreign language'.

Concerns have been expressed in the pages of *Current Science* on the poor current contribution of Indian scientists to the world pool of scientific knowledge. One of the main reasons for this state of affairs is our failure to act on the suggestions made in the learned reports like the one quoted above. Some suggestions for action can be made as follows:

All India institutions like IITs and IIMs can act as pioneers in this regard by conducting a parallel regional language section in addition to the English language sections as conducted now. For example, IIT Madras can have Tamil medium sections while IIT, Kanpur can have Hindi medium sections. The educational resources like laboratories can be shared by both the media students.

Massive Government funding following the example of Japan can be made for the training of faculty, preparation of text books in the regional languages.

The successful Regional Language Educational model developed at the All India institutions can be later replicated in other institutions.

1. Education and National Development. Report of Education Commission 1964–66. National Council of Educational Research and Training, New Delhi, 1964.

V. PARAMASIVAN

Hindustan College of Engineering,
Old Mahabalipuram Road,
Padur (via) Kelambakkam,
Kanchipuram District 603 103, India
e-mail: hetc@vsnl.com

Importance of biology

M. G. Sanal has made very casual comments in a recent issue of *Current Science*[1] on the importance of scientific publications, biology and biologists. Probably many biologists, who have read this article, may have been surprised and shocked by the comments. I partially agree with the author that there is no ideal way to assess the quality of all published research output apart from our own critical reading. This is not only a problem for publications related to biology but also to all scientific communications. But this does not necessarily mean that there is an increase in junk and fake publications in biology. Scientific productivity, in the form of intellectual contributions to the advancement of science and ultimately communicated in written form, is commonly considered to be of fundamental importance to scientific advancement. However, the importance of citation factors is completely overlooked in the correspondence. Citation indices and impact factors are valuable to assess the quality of publications.

In fact, publications arising from biological sciences are far less in number compared to any other branches of science in India. For example, a survey conducted by Basu and Aggrawal[2] suggests that of all the papers covered in five years of survey (namely those in 1990, 1994, 1997, 1998 and 1999), those in chemistry were the largest, followed by physics, clinical medicine, biomedical research, and engineering and technology. Also, the survey further revealed that biological publications have average higher impact factors compared to others. The figures clearly suggest that the author has a wrong impression.

The author's hostile and unrealistic comments on biology and biologists are completely biased and misleading. Statements like 'one need not be intelligent to be a biologist, and biology is rather easy to understand and perform and relating this to one of the reasons to more students opting for biology rather than to other basic sciences' will definitely cause pain to any biologist and budding biology students. Was Aristotle, who is considered 'the father of biology', not an intelligent man? Were many famous mathematicians as well as scientists from other disciplines, who later in their career became professional biologists not intelligent men or women? How about Charles Darwin, who was a basic biologist and chosen as 'man of modern science' ahead of Einstein by an Internet poll survey recently?

Some people think and believe that biology is a different kind of and very easy science. But in reality it is not. This doubt arises because of there being no laws in biology (as there are in physics), and the differences between typological thinking (characteristics of the physical sciences) and the population thinking that marks modern biology. In his last book[3], the famous biologist Ernst Mayr attempts to tackle this important, albeit not exactly novel, question: is biology a different kind of science? Mayr, in this book, points out the limited usefulness of mathematical formalism in partially historic disciplines such as biology. Through a largely historical and informative approach, Mayr then goes on to argue that biology is sufficiently autonomous from physical sciences that no useful 'reduction' can be carried out beyond a fairly limited scope.

Sanal notes that biologists have not been able to 'create' a new organism and are still exploring the existing biological systems. Perhaps the author is totally unaware of transgenic plants, cloned animals (e.g. Dolly!), a unique frog species discovered recently in Western Ghats of India (which was considered as 'discovery of the century') and many more path-breaking recent research publications in biology. Any scientist would agree that any biological system is extremely complex and we are still far from understanding fully how certain systems work. No one expects biologists to create a new plant or animal and it is not the principal objective of biologists. Basic scientific research (including biology) is driven by academic curiosity and there is not simple route from science to new technology. According to Wolpert, who delivered the famous 'Medawar Lecture in 1998, entitled 'Is science dangerous' (for detailed script of the lecture see ref. 4), science is not the same as technology. Basic science researchers are not directly responsible for technological applications of science; the very nature of science is that it is not possible to predict what will be discovered or how these discoveries could be applied. The distinction between science and technology, between knowledge and understanding on the one hand, and the application of that knowledge to making something, or using it in some practical way, is fundamental. Science produces ideas about how the world works, whereas ideas in technology result in usable objects.

It is unfortunate that Sanal has ignored the above facts, basic philosophy of biology (or science) and has made hostile comments regarding a fascinating subject, biology, which is considered as 'mother' of all basic science disciplines, perhaps due to his unrealistic expectations and misunderstanding. If biology is so simple and not important why have other branches of basic science been associated with it and resulted in new branches like biochemistry, biophysics, bio-statistics, biomechanics, etc. in late 20th century? These are some of the reasons why biology (and all its sub-branches) is attracting more funds as well as students rather than for its simplicity. If biology appears simple and attractive to students then kudos to biology teachers and biologists who make it simple to understand and attractive to students. No one in India can force students to opt for biology and it is their choice. Unlike Sanal, all science professionals and teachers treat all branches of basic science with equal importance. There is no such think as one branch being easier or important than another.

1. Sanal, M. G., *Curr. Sci.*, 2006, **90**, 1169.
2. Basu, A. and Aggrawal, R., http://dsir.nic.in/pubs/itt/itt0104/scirep.htm
3. Mayr, E., *What Makes Biology Unique? Considerations on the Autonomy of a Scientific Discipline*, Cambridge University Press, Cambridge, 2004.
4. Wolpert, L., *Philos. Trans. R. Soc. B*, 2005, **360**, 1253–1258.

RAJKUMAR RADDER

The School of Biological Sciences,
University of Sydney,
NSW 2006, Australia
e-mail: raju@mail.usyd.edu.au

Photorespiration and mitochondrial respiration are not just evolutionary leftovers

Photorespiration, a process that diminishes net photosynthesis by ≈25% in most plants, has been viewed as the unfavourable consequence of plants having evolved when the atmosphere contained much higher levels of carbon dioxide than at present. This biological process was considered to be a wasteful process under the present situation. The deleterious impact of photorespiration apparently led to the evolution of C_4 plants. In order to improve the photosynthetic efficiency of crop plants, modification in the O_2 binding site of Rubisco by site-directed mutagenesis was proposed. However, the outcome of the research over the recent past clearly indicates the significance of this process as a protective and supportive mechanism against photoinhibition and an array of environmental stresses[1]. Plants exposed to elevated CO_2 show diminished growth and the results with both *Arabidopsis* and wheat plants when exposed to elevated levels of CO_2 and low levels of O_2 (a condition that inhibits photorespiration) slowed down nitrate assimilation in their shoots[2]. This process enables the plants to take inorganic nitrogen in the form of nitrate and convert it into a form that is useful for plant growth[3]. In the absence of photorespiration, concentration of O_2 free radicals may reach high levels and can attain a destructive level in the chloroplasts. As we anticipate a doubling of atmospheric carbon dioxide associated with global climate change by the end of this century, the research outcome suggests that it would not be wise to modify/eliminate this biological process by molecular tools. The intricate biochemical, physiological and structural relationships that make up