

Coping with liberalization

This is an excellent article (*Curr. Sci.* 1996, 70, 5) in which I am wholly on the side of the editors and of liberalization. Their conflict to which they refer is with those who think that a readable science journal should be a trade union manifesto of the science community, a monolithic face to the world in their unceasing quest for more money. I agree with the editors that this is an unreasonable and harmful stance; the more open we are about ourselves, disagreements

and all, the more confidence will the educated public have in the science enterprise.

Two minor comments; First, the difficulties described are in no way peculiar to India, everywhere the public has to be taught that science is not about unanimity. (This is why I feel entitled to comment.) Secondly, I regard the sentence 'To the average reader, opinions on matters of science policy make far more interesting reading than the turgid

prose of most research articles or the esoteric scholarship of historical sections and book reviews' as unnecessary and inappropriate criticism of authors and reviewers.

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Census of India's biodiversity

I read T. N. Khoshoo's article (*Curr. Sci.*, 1995, 69, 14-17) 'Census of India's biodiversity: Tasks ahead' with interest and curiosity and found nothing on what the title suggested. The author, after giving some data on biodiversity, where he modified his own earlier data (*Curr. Sci.*, 1994, 67, 577-582), took up the task of defending taxonomists and indirectly ridiculing much of biotechnology being done in India. According to him, 'these surveys, BSI and ZSI in particular, and taxonomists in general, are today overshadowed by the so-called, and more often second-rate, biotechnologists and environmentalists'. Later he goes on to say, 'in India, there are some outstanding performers at two or three centres in the country... the general clan of biotechnologists is not likely to make any worthwhile contribution in the foreseeable future despite heavy investment.' Throughout his article, the author complains that there is alleged apathy for taxonomy, and also complains of undue emphasis on biotechnology.

I feel that the author has written this article on the basis of a very subjective assessment of the state of biology research in the country. He is perhaps not conscious of the fact that now there are certainly more than a dozen centres in the country where world class biotechnology involving recombinant DNA technology is being undertaken - there are about half a dozen laboratories in Delhi alone and more such laboratories

are known from NCL (Pune), BARC/TIFR (Bombay), CCMB and Central University (Hyderabad), Madurai Kamaraj University (Madurai), IISc and Astra Research Centre (Bangalore), NBRI (Lucknow), BHU (Varanasi), Calcutta University and Bose Institute (Calcutta) and M. S. University (Baroda). I doubt if scientists working in these laboratories, after having published papers in reputed journals can be classified as second-rate biotechnologists. The contributions of these biotechnologists are already being felt and there is no reason to feel that investment in this research area was not warranted.

Contrary to the contributions of plant molecular biologists/biotechnologists, it is difficult to find taxonomists who regularly publish papers in reputed journals in the field of taxonomy (e.g. *Taxon/IOPB Newsletter*), utilizing modern tools of taxonomy. In the past, I had a chance to work with Bernard R. Baum of Canada, leading to publication of several articles on taxonomy of wheat, triticale, *Aegilops*, *Agropyron*, *Avena*, etc. but never came across any paper on taxonomy of cultivated plants (and their wild relatives) by an Indian taxonomist utilizing modern tools. Hundreds of papers on taxonomy and evolution of crop plants utilizing molecular markers (RFLPs, RAPDs, microsatellites, isozymes), nucleotide sequences and computer software have been published during the last few years, but hardly any

from India, certainly not from the so-called taxonomists, who, barring exceptions, do floristics rather than taxonomy. When you talk to them about the use of molecular data or computer software, they would frown at you as if you are unnecessarily intruding in their discipline. Biodiversity at several places in India (e.g. M. S. Swaminathan Foundation for Research) is being characterized by molecular markers, not by taxonomists, but only by molecular biologists. The need for using these modern tools for studying taxonomy is often emphasized by non-taxonomists in India who, nevertheless, recognize the importance of taxonomy. Further, although most of our taxonomists in India are aware that biodiversity has become an important subject, they may not be familiar with provisions of the 'Convention on Biological Diversity (CBD)', 'International Undertaking on PGR', 'International Code of Conduct for Plant Germplasm Collection and Transfer (1993)', 'CGIAR/FAO agreement' establishing the 'FAO's International Network of Ex-Situ Germplasm Collection (1994)', etc. Therefore, there is a need that several of these subjects receiving the attention of taxonomists and crop scientists at the international level, receive the deserved attention of the taxonomists in India also. There is also a need of realization by the taxonomists that the taxonomy of cultivated plants and their wild relatives is as important as the taxonomy of flora in general. I

feel that the comments by T. N. Khoshoo are unfortunate, since these may be used by those taxonomists of our country, who do not like to make use of modern tools in the field of taxonomy.

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T. N. Khoshoo replies:

Speaking in favour of taxonomy should not be construed as being against biotechnology. This is a totally wrong premise. Also, one does not have to recount at length the impact of molecular approaches on taxonomy; these approaches are now routine and known even to college students. However, these are particularly relevant to small

taxonomic assemblages. One cannot write entire floras and faunas on the basis of biotech approaches. No country as large as India has such a flora or a fauna. As to experimental taxonomy of cultivated plants, one does not have to go abroad to do this work. In fact, M. S. Swaminathan, T. N. Khoshoo, R. P. Roy and others had flourishing schools in India and the initial papers were written in the 1950s. In an earlier paper (*Curr. Sci.*, 1994, **67**, 577–582), I have specially stressed the importance of upstream biotechnology for India together with its underlying scientific, technological, economic and even political implications. The paper was received well both in India and abroad. It became clear that biotechnology is critical for India's bioindustrial development. Both these papers were written after a thorough review of the biotechnological scene in the country. It revealed that there are only a few centres doing upstream biotechnology; the rest are involved in routine and repetitive work. The former is likely to lead to academic

and/or commercial products, but one is not sure about the latter. The members of some Task Forces of the Department of Biotechnology, Scientific Advisory Committee-DBT and DBT-SAC-Overseas have often expressed concern about the state of India's taxonomy and urged that the same be strengthened particularly in the case of microorganisms (see also *Curr. Sci.*, 1995, **69**, 968–969).

Lastly, once in a while, self-introspection is necessary and one should be courageous to face facts. Excellence cannot remain hidden because such work stands out by itself, while mediocrity has to advertise and cry hoarse to be recognized.

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RESEARCH NEWS

Auto-catalysis as the possible origin of biomolecular chirality

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Existence presupposes origin! The mystery of the origin of optical activity is the chemist's formulation of this philosophical dictum. Chemists (perhaps unlike physicists), however, do not take easily to philosophy, and are content to chisel away at practical problems of direct relevance to human concerns. And even when, on the odd occasion, chemical problems take on a philosophical colouring, the chemist remains ingeniously practical. A recent example is discussed further below, but first some background.

All biomolecules are homochiral, i.e. of two possible mirror image forms (enantiomers), only one is consistently found to occur. The phenomenon flouts statistical common sense, which dictates that both forms be found in equal amounts. But such 'anti-Boltzmann'

behaviour is redeemable if there is an appropriate input of free energy in the synthesis of these biomolecules. Enter the practical organic chemist. It has, of course, long been known that molecules can be produced largely in one enantiomeric form in a chemically chiral ('one handed') environment, such 'asymmetric synthesis' being quite efficient if one of a pair of reacting molecules is chiral. In fact, when the chiral partner is a catalyst, the arrangement is considered as perfect as can be.

The 'chicken-egg' situation is now apparent. Biomolecules can, of course, be produced using chiral catalysts, but where would these latter species come from? (This is the molecular incarnation of an ancient philosophical scourge.) There is a fascinating collection of impressive theories, but two broad categories

may be discerned – determinate and chance (!). The determinate ones essentially shift chiral responsibility to a non-chemical agency, listing: polarized light, electric, magnetic and gravitational fields, α and β rays, and parity violating weak interactions¹⁻³. The chance theories, too, commandeer concepts of noble lineage, and usually invoke small local perturbations of the global chiral symmetry, which are subsequently amplified (irreversibility, non-equilibrium thermodynamics)¹⁻³.

Interestingly, there is a point of convergence for the determinate and chance theories (chemistry demarcated from philosophy). Expectedly, the two theories have their strengths and weaknesses, and the *via media* combines the virtues of the two. Determinate processes are rather inefficient and produce