

Herbaria could also illuminate the evolutionary trends in the taxa with environmental implications. Study of populations within a species could provide information as to whether a particular site is undergoing accentuation of aridity or not. Certain species exhibit a number of populations, for e.g. the grass *Oropetium thomaeum* Linn. f. [Tandon, R. K., Ecological investigations on *Oropetium thomaeum* (Linn. f.) Trin., Ph D thesis, University of Delhi, 1977]. It may be possible to arrange these populations along a gradient of humidity–aridity. It would be an interesting exercise to compare the population of a particular site of Rajasthan or Sind with the herbarium specimens collected from the same locality a century or so ago and to note whether a trend towards xericity is indicated. Such an investigation may give a clue to a biometeorological shift or stability in the degree of aridity.

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## Animal usage in research

The *Current Science* issue of 25 August 1995 carried a special section on Animal Welfare. In a prefatory note to the article entitled 'On the use of animals in research and education' you identify one of the authors Dr Jane Goodall as a noted advocate for the noninvasive use of animals in research. But Dr Goodall is not an advocate for animal use at all. What she advocates is conduct toward animals with ethical consideration and with respect.

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## Biodiversity information networks

C. P. Geevan's article (*Curr. Sci.*, 1995, 69, 906–914) suffers from the deficiency of not identifying adequately the information sources or the ongoing efforts in building up such sources in India. A glaring example is the omission of efforts of the BSI and the ZSI in creating an information network. There are a few others that should have been examined and mentioned. The other difficulty with this article is its thorough neglect of the limitations of the telecommunication infrastructure in this country, which necessitates development of suitable hybrids of electronic and conventional databases and mechanisms of dissemination. Without a thorough analysis of at least these issues, the article is an exercise in speculation without the rigour that converts speculation into reality.

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### C. P. Geevan replies:

Balaji's comments pertain to two key points:

- (a) the information sources need to be fully identified, and
- (b) the limitations of telecom infrastructure in the country have been neglected and that these limitations necessitate the development of 'hybrid' databases.

With regard to the first observation, I would like to stress that my focus was primarily on establishing special interest groups for biodiversity conservation making use of available or emerging computer networking options and not on information sources in their numerous forms. Nor was there any selective mention or omission of information sources. I have pointed out only networking efforts which involve a variety of organizations and *not* those being carried out *within* large institutions. It is quite well known that BSI and ZSI – among the oldest institutions – possess the largest depositories of biodiversity information in the country. However, networking efforts, if any, in-

itiated by them with the participation of other organizations have not been publicized. If such an initiative exists it certainly is a welcome development.

Both small and large organizations have a place in networking, since the information available with a minor player may potentially be of high value to another participant. It may also be noted that a large number of research institutions and NGOs in the country already possess or have initiated databases in the areas of their concern and are important information sources. I have also refrained from identifying information sources since it has been much discussed. What is needed, however, is easy access to both information and expertise. Even if such access is based on very low speed modems connected to poor telephone lines, it will make a world of difference.

In his second observation, Balaji argues for 'hybrid' (distinct from multimedia) databases, and implies that the present telecom infrastructure cannot support the concept presented in my article. I am unaware of instances of database designs that are able to overcome the barriers imposed by the technology level of communication systems. It will be a major breakthrough if some 'hybrid' data structure can perform a miracle of sorts by circumventing these limitations. Undoubtedly, considerable R&D effort is needed to transform this fond hope into a technical possibility. Sadly, there are no reports of such efforts.

As regards the adequacy of telecommunication links in the country, it may be noted that (a) networking efforts in India have progressed in spite of severe constraints, and (b) the telecom infrastructure in the country is not so bad as to deter large-scale data networking. Such scepticism is rather misplaced, particularly at a juncture when the telecom options are comparable to that in developed countries. The telecom network in India, though not among the very best in the world, certainly does not rank among the worst. It is, in fact, possible now to operate data links from some of the remotest locations. If better links are a must, the user can opt for VSAT.

The critics of data networking using terrestrial links have been proven wrong by the very success of such networks

both in commercial and non-commercial sectors. For instance, when the ERNET project began it was based primarily on telephone links using low speed modems (300 bps!) when our telecom infrastructure left a lot to be desired. Its success needs no elaboration although critics had not given it much chance of survival. The success of highly reliable commercial data networks in India are other examples.

The telecom facilities available are ade-

quate to initiate the plan presented in my article. Moreover, we have every reason to think that the telecom facilities will improve, given the ambitious plans of the Department of Telecommunications. Although it is possible to find many faults with the telecom sector, those are not what prevents the realization of the plan outlined. It is certainly feasible to translate the plan into reality as an overlay network riding over an existing one such

as the ERNET. The initiatives noted in my article show that beginnings are being made and the plan is, indeed, viable.

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## OPINION

# What can be done with science education in Indian universities? An attempt at a synthesis

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What options are left for the university education in the country?<sup>1</sup> We were somewhat surprised by the extent of correspondence, national and international, at a personal level, a previous paper on education sparked<sup>2</sup>. However factually and inferentially it may be correct, we were told, it tells little as to what is to be done. The dilemma that confronts us is: do we serve God (of quality) or Mammon (of actuality)?

A real question of immediate import came in the way of a challenge recently to us at Pune University as to what can be done for life sciences at the University. Extensive discussions combining perceptions of our students with those of the faculty led us to realize that most plans are improbable and left us with a very few options. We summarize here a feasible blue print for action, within the university structure.

The central premise is that university reforms cannot be imposed and have to come from within. The turbulence of the last two decades forced upon those who manage industry, government or any other organization the realizations: (i) that an organization is as efficient as the human beings that it has; (ii) these human beings need to be constantly motivated. Ideologies, rhetoric and *esprit de corps* no longer substitute 'hard' incentives. (iii) It is crucial that the 'incentive' be perceived as such by the individual for whom

it is meant. (iv) No efficient organization can be run with fuzzy, contradictory and poorly communicated goals. What is being done, why and with what results must be clearly communicated both inside the organization and outside. Thus, reforms in the university can come only when a strong, realistic and credible incentive package (by incentives we do not just refer to pay-scales) is in place and when university goals are clearly articulated. There are fundamentally three players in the university system: the students, the faculty and the university administrators. We endeavour to identify, here, what 'incentives' each group actually identifies itself with and what goals each group visualizes for the university<sup>3</sup>. To be effective, it is necessary to systematically pare away platitudes and clichés thinly veiled as idealism filling the university charters and substituting for proper peer pressure in university life. We are therefore grateful to innumerable students, teachers and administrators for candid views regarding what touches them most, and what they, as individuals, 'really' want. We trust that this is not translated here into an unseemingly gross portrayal of the functions and the functionaries of the universities. It is a sign of our times that governments and peoples across the world have had to make their peace with pragmatism. Why not the University?

### The students

The students are clear on *all* issues. Whether we agree with their perceptions or not is a different matter. They have come in after their B Sc. It is *clear* to them that what lies ahead of them after their M Sc is a big question mark! They believe that they are the consumers of the university, with the difference that they have no rights. They believe that the degree should be a value-added product and they realize that it is not. Research is not the highest on their agenda. Most prefer some professional training. None get it.

Some amazing views come out of intensive personal discussions. The students seem to perceive the teachers as a community, . . . the professional scientist, the social climber, the socialist, the administrative ham, . . . as those to whom teaching is merely a front to cater to a variety of other activities where the returns are better. The student does not think much of a teacher, as worth emulating. It is not that they do not understand and appreciate the occasional authenticity and teaching from first-hand experience by a committed teacher. But it is non-essential. The students prefer those who teach them something regularly and not expect them to work too hard. By and large, they prefer the teachers who are generous about giving marks.