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CORRESPONDENCE

Paradigm in dictionaries

The editors of the latest earth-sciences dictionary[1] wrote, 'As recorders we express no opinion'. The words orocline, rhombochasm, sphenochasm, sphenopiezm, oratath, oroclinotath and nematath pertaining to Carey's[2] theory of expanding earth find no place in the dictionary though there is an entry for Carey and another for expanding earth. This is certainly expressing an opinion. A dictionary 'records words and expressions that are *in current use* and explains meanings attached to them', the editors wrote[1] (emphasis added). The expanding-earth hypothesis is a paradigm that has lost to plate tectonics, and the vocabulary of the former is not in current use. A paradigm is[3] 'the source of the methods, problem-field and standards of solution accepted by any mature scientific community *at any given time*' and has aspects of '*selection*, evaluation' (emphasis added). Thus the selection of terms on the basis of current use furthers the hold of a paradigm or what was called the 'ruling theory' by Chamberlin[4]. Incidentally, the publication of the earth-sciences dictionary coincides with the centenary of Chamberlin's oft-reprinted paper on multiple working hypotheses. Chamberlin discussed the methods of ruling theory, working hypothesis and multiple working hypotheses. The discussion is obviously incomplete without mention of the method of multiple ruling theories, held and debated by different schools or traditions. The last method has all the advantages of the method of multiple working hypotheses recommended by Chamberlin, and yet is more realistic and practical, as it puts no ideal requirements on individual researchers, and, even if they stick to their favourite ruling theory, offers the intended advantage to the community of scientists by public conduct of controversies. Compilers of scientific dictionaries who wish to 'express no opinion' of their own must adopt a non-paradigmatic or plural-selection criterion. Contemporary usage is not always such a criterion. A historical outlook is more desirable in dictionary-making, because theories not in vogue now can make appearance again and, at times, with advantage.

1. Allaby, A. and Allaby, M. (eds.), *The Concise Oxford Dictionary of Earth Sciences*, Oxford University Press, Oxford, 1990, pp. vi, 59, 133.
2. Carey, S. W., *The Expanding Earth*, Elsevier, Amsterdam, 1976, pp. 80–84.
3. Kuhn, T. S., *The Structure of Scientific Revolutions*, The University of Chicago Press, Chicago, 1970, p. 102.
4. Chamberlin, T. C., *Science*, (old series), 1890, **15**, 92.

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SCIENTIFIC CORRESPONDENCE

Flowering in bamboo

The report[1] of induced flowering in tissue-cultured bamboo and letter[2] published in this journal are based on the incorrect notion that all bamboo clumps, without exception, flower only in fixed cycles. Most bamboo species show precocious flowering and seedlings of 2 to 3 years age have been known to flower and produce viable seeds. Birbal[3] reported that seeds of *Dendrocalamus strictus* collected from flowering of 1894 and sown in May 1896 flowered in April 1899 and produced, in June 1899, a crop of healthy seeds, some of which were sown and germinated. The flowering culms were 3 to 5 feet (1 to 1.5 m) high. Ahmed[4] reported that 2-3-year-old seedlings of *D. strictus* flowered in the Porahat Forest Division of Bihar. Hasan[5] reported that 2–3-year-old seedlings of *Bambusa tulda* sown in the Forest Research Institute, Chittagong, flowered and produced seeds. Of 39 clumps raised from these seeds 16 behaved similarly.

In temporary forest nurseries, where large numbers of seedlings of *D. strictus* (Roxb.) Nees and *B. arundinacea* (Retz.) Willd., the most commonly planted bamboo species in India, are raised and some remain unused, it is quite common to see flowering in some of the 2-3-year-old clumps.

What is claimed to be induced flowering is most likely the result of an accidental selection of seed with inherent tendency of precocious flowering. Tissue-culture plantlets of various species of bamboo have been raised from seedlings with seed as the starting point. No group has successfully raised plantable material from mature culms. This type of research has no practical value: genetic superiority of the explant is not established before picking the same for multiplication. *B. vulgaris*, which has not flowered gregariously since 1810, has not been grown successfully by any tissue-culture group in India so far. Most bamboo species have been raised successfully by rooting of nodal cuttings from culms obtained from mature clumps[6]. That tissue culture has not succeeded with mature culms shows either its limitations or lack of effort on the part of plant scientists.

1. Nadgauda, R. S., Parasharami, V. A. and Mascarenhas, A. F., *Nature*, 1990, **344**, 335; see also Anonymous, *Curr. Sci.*, 1990, **59**, 346.
2. Bhatia, C. R., *Curr. Sci.*, 1990, **59**, 583.
3. Birbal, B., *Indian For.*, 1899, **25**, 305.

4 Ahmed, M., *Indian For.*, 1969, **95**, 214
5 Hasan, S. M., Proceedings of Workshop on Bamboo Research in Asia, Singapore, 1980, p. 16
6 Chaturvedi, A. N., *Indian For.*, 1988, **114**, 489

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A. F. Mascarenhas replies:

We do not agree with Chaturvedi's views.

We would like to see the statement 'most bamboo species show precocious flowering' substantiated by a scientific reference. There are several hundred bamboo species. The references that have been cited are very interesting. However, many of the findings reported in these could be accidental. If, out of 39 clumps raised from prematurely developed seeds of *B. tulda*, 16 clumps 'behaved similarly' (Hasan 1980), we should by now be having a fairly big population of bamboo clumps exhibiting premature flowering! The flowering response reported in culture by us is not accidental. It is fully reproducible and has also been demonstrated with different batches of seed. The statement 'no group has raised successful plantable material from mature culms' may have been true a few years ago. There are now several groups who have obtained success with mature culms. In fact, in our own laboratory, we have raised cultures and plants from such material. We are also aware and happy that there are now several groups in India attempting to use mature culm cuttings as vegetative propagules.

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NEWS

Adaptive problem solving

A one-week seminar was recently (8–15 May 1991) held at Kodaikanal on the topic 'Object-oriented analysis and programming'. The seminar was sponsored by the Department of Applied Science of the American College, Madurai. The participants were young scientists from Mysore University School of Studies in Physics; Raman Research Institute, Bangalore; Kodaikanal International School and the physics and applied science departments of the American College.

Object-oriented analysis is a recently developed systematic way of analysing problems for solutions using computers. Its new emphasis includes the encapsulation of data abstractions and operational abstractions in a way which tends to make the resulting programs relatively insensitive to changes in the problem. This means that additional demands or requirements of the user on the system can be easily incorporated without disturbing the system itself. This has obvious advantages in scientific situations where the essence of creativity is innovation. Sadly we often find our computational tools become too easily ineffective when problem innovations or new user demands/requirements are introduced. Object-oriented analysis is intended to reduce this effect.

For realistic experience and learning the participants used a real administrative problem which demonstrated in its solution many of the features and advantages of the method. The discipline and methodology can certainly be used to advantage in many scientific situations also and readers may find the book *Object-Oriented Analysis* by Coad and Yourdon (Prentice Hall, New York, 1990) a worthwhile introduction for both scientific and computer-oriented use.

The participants in the seminar were able to appreciate the potential impact of this new methodology on computer-aided solutions in their own fields, including the very strategic area of computer-aided instrumentation of many sorts.

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