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CORRESPONDENCE

Affinities

I have gone through the special issue of *Current Science* (1991, vol. 61, nos. 9 & 10). I wish to point out that the description of the photographs of *Cyclanthodendron sahnii* and *Tricoccites trigonum* has not been in accordance with the recent work on these genera. Affinity of *Cyclanthodendron* is shown with Cyclanthaceae, palm group, and *Tricoccites trigonum* with palms. Now it is an established fact that *Tricoccites trigonum* is a fruit of *Cyclanthodendron sahnii* and its affinity is shown with Scitamineae and not with Cyclanthaceae or Palmae.

Reference: Biradar, N. V. and Bonde, S. D., The genus *Cyclanthodendron* and its affinities, Proceedings of the 3rd IOP Conference, Melbourne, 1988 (eds. Douglas, J. G. & Christophel, D. C.), 1990, pp. 51–57

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Guest editors (B. S. Venkatachala and C. V. Subramanian) reply:

The purpose of the photographs of fossils in the centrespread is essentially to highlight some of the striking and interesting discoveries of fossil plants by Professor Birbal Sahni. In writing the legends for these figures, it is natural that we have adhered to the names used by Sahni for these very specimens and to their possible affinities as conceived by him. Especially this is important for form genera such as the ones which a palaeobotanist usually describes. This is the logic for the legends of all the illustrations in the centrespread.

Regarding affinities, there is much controversy and it is never easy to reconstruct a plant from fragmentary remains of form genera. In this sense, though we do not deprecate any attempts at reconstruction, we cannot accept anything as final till it is amply and fully substantiated.

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Of maize and models

T. Veena and N. Sigamani's quantitative analysis (*Curr. Sci.*, 1991, **61**, 395) apparently suggests that the maize-like structures at Somnathpur do not represent maize ears. I think this analysis is grossly deficient in the following respect.

Indian temple sculptures are highly stylized and proportions in a stylized form may be much different from those of the object. Take human figures for example. Female breast sizes are usually exaggerated and waists thinned down. If one compares the frequency distributions with those in human populations we are almost sure of getting statistically significant differences. If so, do we conclude that they were not modelled after humans? If a statistical analysis on quantitative parameters is to be employed in the case of maize ears, human figures and sufficient number of other, 'known' objects should be used as 'controls'. Any analysis without appropriate controls is meaningless.

Personally I am not convinced that the Somnathpur structures are maize ears. I would only like to point out that at present we are not in a position either to reject or to accept the hypothesis. A broader and more meaningful issue would be how much variation from the object does stylization cause without loss of identity of the object. This again may vary in different schools of art. However there could be a generalizable threshold above which the identity of the object is lost. An attempt to answer such a question will not only help resolve the maize case but will contribute substantially to our understanding of psychology, ethology, anthropology, archaeology and both ancient and modern art.

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T. Veena and N. Sigamani reply:

We agree with Watve that sculptures of any period are likely to have been transmogrified from the original model in accordance with the fundamentals of the art of that period. But we do not agree with his comment that, because of such transmogrification, it might be meaningless to test for similarity between the sculpture and the original model.

Watve feels that there may be a 'threshold' for any such transmogrification of the model below which identity is not completely lost. This may be the reason why Watve, like millions of others, does not confuse the human sculptures of our temples (though they have exaggerated breasts). In other words, if the sculptures are within the 'threshold', there is probably no disagreement in general about their identity.

Watve also is 'not convinced that the Somnathpur structures are maize ears'. Why? If they were to be within the threshold of the maize model, there should not be any disagreement about their identity as well. Our paper stems from the fact that for some the structures are 'strikingly similar' to maize ears[1] but for others (e.g. Watve) they are not. Therefore we based our comparison on the null hypothesis that the maize-like structures are 'strikingly similar to maize'; in which case the structures and maize ears should be very similar in all (or at least most of) the traits that we can consider.

Further, if there is transmogrification it cannot occur in all the characters because by this the structure might lose its identity (cross the threshold). But in our study all the four traits considered showed MLS to be different from maize ears suggesting that MLS might not even be a transmogrified form of maize ears.

Finally, though it is a general feeling that breast size of female forms in our sculptures is exaggerated, it might not indeed be so: When an artist chooses models for aesthetic representation—take for instance present-day advertisements—he would certainly prefer those who/which are far distinct from the mean of the population (probably because instinctively we all have an appreciation for rare things). But the models thus chosen would certainly fall within the range of the population. In our study, we considered a wide array of genotypes of maize ears so that such extreme representations were also taken care of.

In summary, we do not agree with Watve that our analysis is grossly deficient.

1. Johannessen, C. L., *Nature*, 1988, **332**, 587.

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SCIENTIFIC CORRESPONDENCE

Seismicity and the Tehri Dam

There have been a number of articles in *Nature*, *New Scientist*, Indian newspapers and magazines on the damaging Uttarkashi earthquake where a loss of more than 1500 lives has been reported. The earthquake occurred on 20 October 1991 and had a magnitude of 6.6 on the Richter scale. Its epicentre is not far from the 260-metre-high Tehri Dam under construction on river Bhagirathi in the central region of the Himalaya.

Gaur[1], has stated that the Uttarkashi earthquake may mark 'the onset of precursor phase preparatory to a major earthquake of magnitude greater than 8'. James Brune of Nevada University, USA, has warned in an article in *New Scientist* by Fred Pearce[2], that the greater risk of 'the big one' will be in the next few months, long before the Tehri Dam is completed. He further implies that it would take three major earthquakes of magnitude 8 or so to release the tension that has been building up along the seismic 'gap'. It is not understood how such frightening predictions could be made without adequate data base, systematic risk analysis, controversial status of gap theory and nascent level of the physics of the earthquake processes. Such danger warnings from seismologists scare the people and cause panic among them.

The *Bulletin of the Seismological Society of America* has brought out a special issue on 'The 1989 Loma Prieta earthquake and its effects'. This earthquake of magnitude 7 on 18 October 1989 occurred in the northern segment as against predicted rapture of the southern Santa Cruz Mountain region of the well-known St. Andreas Fault in California. In contrast to the above mentioned Tehri forecasts, Hanks and Krawinkler[3], after examining the data of the best instrumented region, state that 'the Loma Prieta earthquake is a reminder that earthquakes do not have to occur where we want them to occur or forecast them to occur and that our understanding of how and why earthquakes occur and recur, even along and near the best studied active crustal fault zone in the world is rudimentary and incomplete'.

The entire Himalayan region is prone to earthquakes and there have been four great earthquakes of magnitude greater than 8 between 1897 and 1950. The simple 13-year recurrence period (four earthquakes in 53 years) may suggest, as probably estimated by Brune, that since 1950 Himalayan region has accumulated unreleased stress for three more large earthquakes in the continent–continent collision zone between Indian and the Eurasian plates. However, area-wise data analysis of (i) general physicomechanical conditions of the collision zone, (ii) seismic transmission property, and (iii) maximum peak horizontal acceleration are not available. Any conclusion regarding stress accumulation in any particular 'gap' area may be debatable.

In a recent article in *Nature*, Seth Stein[4] has reported that in ten-year period (1979–89) 37 earthquakes of magnitude 7 and above occurred in the northern part of the Circum–Pacific plate boundary, which has been divided by McCan *et al.*[5] according to gap theory model into high-, medium- and low-earthquake potential seismic gaps. The findings are that out of these 37 earthquakes, four (11%) occurred in the high-potential seismic gaps, 16 (43%) in zones of intermediate potential and 17 (46%) occurred in the indicated low potential gaps. Stein, 'by way of analogy', states that 'Fatal attacks by grizzly bears are more common in Montana than in New York. Does this indicate a "bear gap" in New York so that an attack is now more likely there?'.

There are several factors, both known