

contribution to the "recent literature on nuclear winter research" has been quite explicit in stating the limitations of our own work, and we specifically call for others to begin answering difficult questions at scales that will be perpetually sub-grid scale to most atmospheric models. Therefore we do not take the new calculation¹ as a step in moving nuclear winter "toward a scientific exercise" as characterized by Emanuel, but a logical progression of scientific research as already called for by most responsible researchers. This call was either unknown to or ignored by Emanuel in his *News and Views* comment.

We believe we have set the record straight, and hope that this effort will reinforce the notion that good scientific enterprise should be based upon sound empirical evidence, and that when such evidence does not exist appropriate caveats must accompany all statements.

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Evolution with a Japanese slant

SIR—I neither contest your criticism¹ of the recent move in Japan to established a research institute for Japan studies, which the Prime Minister Nakasone supports in order to "export" Japan and its pragmatic socioeconomic system, nor do I condone the role played by some established scientists in Japan in support of that programme.

But I would like to point out that the argument advanced in *Nature* by Dr Beverly Halstead² to refute the evolutionary theory of the Japanese scientist Imanishi needs scientific scrutiny. The references

that Halstead gives (see refs 3-8) do not substantiate the claim that the anti-darwinian theory of Imanishi "would not last long if subject to international attention".

Attempts by some Japanese scientists to underpin the current intellectual trends in Japan, which exalt traditional Japanese values, encompass not only "individualist" thinkers of Imanishi's "Kyoto Elite" (see ref. 1), but also those who base their arguments on developments in biophysics and information science^{9,10}. I have not spared criticism¹¹ of these ethnocentric excesses. Incidentally, Imanishi does not think the term "individualism" in the Western sense should be applied to himself; his view is that the individual can be "poetically" unified with nature without any self-assertion, though he concedes that his scientific career and endeavours would be classed as individualistic by Western thinkers.

On the main theme of Imanishi's evolutionary theory based on the lifestyle partitioning of mayfly larvae, Halstead argues (see refs 3-5) that the association of larvae of a given species is not a consequence of some type of proto-identity, as Imanishi conceives, but simply of a preference for particular physical parameters of the environment. More than a few Japanese biologists feel that, although Halstead has admirably succeeded in giving a good summary of Imanishi's theory, one would need, in order to make dialogues between east and west scientifically meaningful, to read the works of Imanishi¹² and Tokichi Kani¹³ (who was killed during the Pacific War, having been assigned to a hopeless battlefield, on account of his leftist ideology). These classics should be translated into English.

The crux of the matter is the *interaction* between different species, or species-societies as Imanishi puts it. Species will indeed have preferences for certain physical factors, but such preferences may well partially overlap, and thus are unlikely to explain the almost total segregation of habitat between allied species of mayflies observed by Imanishi. Of the five references Halstead gives in support of his thesis, three³⁻⁵ deal only with higher taxonomic groups, ignoring interaction between constituent species, and thus are irrelevant. The fourth⁴ describes experiments to characterize physical preference of burrowing larvae of only a single species of mayfly, and so is also irrelevant. Moreover, the last, dealing with temporal segregation of two trichopteran species at the same aquatic habitat⁷, actually serves as a good example of Imanishi's concept of lifestyle partitioning (*sumiwake*).

Halstead then goes on to state that recent researches "in experimental ecology have demonstrated⁶ that interspecific competition takes place in some 90 per cent of all cases studied". But what has

been demonstrated is merely the presence of *interaction* between species; this may be interpreted as resulting from competition, but Imanishi would argue otherwise. So criticism in terms of conventional concepts is unfruitful. Much more discriminating and extensive observations and/or experiments are needed to settle the question.

I should add that recent work by Kazumi Tanida¹⁴ on trichopteran or caddis-fly larvae of the genus *Hydropsyche* has confirmed Imanishi's earlier results on mayflies as well as those of Kani on various insects in freshwater streams. Tanida has found that each of the six species studied, at the very streams near Kyoto where Imanishi and Kani operated nearly half a century ago, occupies its own distinctive macro/microhabitat, sometimes exactly contiguous and non-overlapping with those of other species, and separate either seasonally, topographically or locally.

The problem is how such a pattern of lifestyle partitioning could have evolved. Only *ad hoc* hypotheses can explain it on orthodox neo-darwinian theory, but this is not so with the theory based on Imanishi's "proto-identity" concept. Naturally, there is a need to devise experimental tests of Imanishi's theory, which is admittedly somewhat unrefined and crude.

Andrew Rossiter, a young British freshwater entomologist, who advised Halstead in Kyoto in 1984 of those references³⁻⁸, has now returned to Japan for a substantial period, and is now apparently recognizing something significant in the work of Tanida, with whom he is collaborating. If Halstead had come to Japan a year later, he might have received different advice from Rossiter. Developments in the next few years will be awaited with interest.

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