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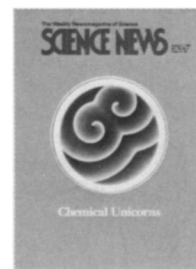
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Cover: By preventing certain reactions from reaching a state of equilibrium, scientists can elicit remarkable chemical behaviors. In this case, a pair of counter-rotating spirals emerged several hours after chemists initiated a complex set of reactions among malonic acid, potassium bromide and potassium bromate within a thin, disc-shaped gel. The dynamic spirals and background reveal how different reactions progress and alternate within the gel. (Photo: Harry L. Swinney, Gordon S. Skinner)



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Letters

Separating the problems

In the sidebar titled "Tracking New World Genes" (SN: 6/9/90, p.361), Bruce Bower states that, in our 1988 report, we contend that "genes and languages evolve at roughly the same rate." This would have been a serious mistake if we had made it. What we actually showed is summarized in another part of the Bower article: We found "a close match between worldwide populations defined by the frequency of specific genes and language families."

It seems that three different problems have been confused: (1) the overall rate of language evolution versus that of genes (everybody agrees that the first is much higher on average than the second); (2) evolutionary patterns, rules and rates of language change; and (3) the patterns, rules and rates of genetic change. What we have shown is essentially unrelated to problem 1 but is linked to, and links together, problems 2 and 3. Our findings are possible only if there is a regular pattern of genetic change, as well as one of linguistic change. Given these prerequisites, on which many

scientists agree, we explain our findings with the suggestion that the pattern of genetic and the pattern of linguistic evolution are both determined by the history of the peopling of the Earth by modern humans. Each fission between populations generated by the occupation of large regions has started a process of differentiation of genes and a similar though independent one in languages. There is no need of an absolute regularity of rates of change in one and the other process, but simply enough that the commonality of patterns is still observable today. A rough consistency of rates in the two processes does not mean that the rates are the same.

A lesser point is that we were far from being as sanguine in placing the first New World arrivals at 35,000 years ago as the article implies.

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I cannot agree with Ruth Gruhn's assumption that only one population — speaking a

language ancestral to all the native languages of the Americas — crossed the Bering Straits around 50,000 years ago ("America's Talk: The Great Divide," SN: 6/9/90, p.360). I would make an educated guess that many groups made the crossing, with the largest numbers migrating during the interglacial period around 100,000 years ago or possibly even 200,000 years ago. In addition, many smaller groups could have migrated during the warm periods that occur cyclically throughout a glaciation. These warm periods result from the variations of the Earth's spin axis and tilt axis, which periodically increase summer sunshine to the northern latitudes. They could well have produced short-term temperatures in that region in excess of those produced today.

If one accepts the assumption that people possessing chiefly a marine culture migrated across the Straits only during periods of increased summer sunshine, then thousands of years would have separated any significant movement, making the unusually large number of native languages more understandable.

Donald E. Bartholome
Hampton, Va.

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