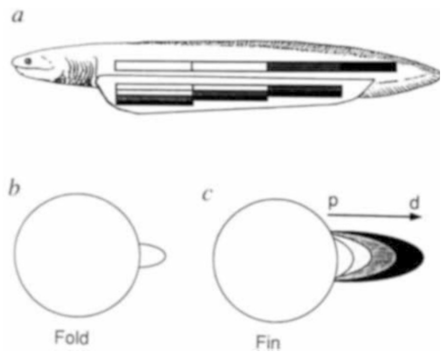
SIR — In agreement with Tabin and Laufer[1], I assume that a fin fold had *Hox* expression domains identical to the parallel *Hox* patterns along the body axis, that is, in a rostral to caudal direction. I would like to suggest an alternative mechanism for the transition from a fold to a new, secondary axis (see figure).

The outgrowth of a simple fold to a more fin-like structure, still extending the length of the animal, must have involved reorientation of overlapping *Hox* expression domains into a proximal to distal direction. I propose that this occurred in response to a growth stimulus exerted by the distal ectoderm of the fold, which may have functionally combined biological elements of the apical ectodermal ridge and the zone of polarizing activity. The *Hox* codes of the respective axial levels of the body axis[2] would have served as the basis



Hox codes in folds and fins *a*, Fish with lateral fin along the body length (modified from ref. 1). *b*, Cross-section at an anterior level through a fish with a simple fold and, *c*, through a fish with a lateral fin. Anterior *Hox* codes are white; more posterior *Hox* codes grey or black; arrow, proximal (p) to distal (d) axis.

for the extension of codes. *Hox A* and *D* genes typical for the posterior body region thus were activated also at an 'ectopic', relatively rostral level. A broad axis along the side line of a fish could evolve into separate anterior and posterior fins, the precursors in evolution to the fore and hind limbs. Each separate appendage already possessed unidirectional *Hox* gene expression patterns at the time of separation, with expression of the 5′ *Hox A* and *D* genes in the most distal area.

One could further speculate that spatial separation of the site of growth stimulation from the centre of *Hox* activation allowed the development of hand or foot plates, that is, the anterior–posterior polarity in the limb axes typical of higher vertebrates.

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Climate change and soil erosion

SIR — O'Hara *et al.*[1] ascribe changes in the rate of sedimentation recorded in Lake Pátzcuaro, central Mexico, to soil erosion promoted by cultivation, and use their findings to challenge the common view that prehispanic agriculture was environmentally more benevolent than later versions.

Granted that agricultural and other kinds of land use influenced sediment yield, the possibility remains that shifts in the seasonal distribution and intensity of rainfall had some effect on the depositional narrative. O'Hara *et al.* themselves present evidence for drier conditions between two of their spells of rapid sedimentation. Recent episodes of aggradation have long been recognized in central Mexico[2]. In the Central Plateau many valleys display extensive alluvial fills whose ages are consistent with deposition between AD 500 and 1700 (refs 3, 4). The fills display slit-clay depletion and are better stratified than their source deposits, features more consistent with sustained stream discharges than with accelerated soil erosion. The explanation might then lie primarily in shifts in the relative importance of combined winter and autumn rainfall produced by latitudinal displacements of the subtropical high-pressure cells[5].

In view of current concerns about climatic instability, it seems surprising that O'Hara *et al.* ignore atmospheric factors when evaluating a uniquely detailed depositional sequence.

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O'HARA *ET AL.* REPLY — In our paper[1], we discussed only the upper 3.36 m (5,000–0 years BP) of the Mastercore. The full 44,000-year-long record from this core shows that environmental changes since the appearance of maize (*Zea mays*), about 3,600 years BP, were more dramatic than those associated with either interstadial/glacial or glacial/interglacial shifts in climate. We note a striking increase in magnetic susceptibility as well as a marked change in the sediment chemistry, with the material accumulating in the lake changing from predominantly authigenic to predominantly allogenic in origin. Land degradation after 3,600 years BP is also reflected in the pollen[2] and diatom (J. P. Bradbury, unpublished data) records. During the late Holocene, pollen of grassy and weedy species increased to levels even higher than those encountered under the arid conditions of the last glacial maximum (LGM, about 25,000–11,000 years BP)[2].

Although lacking the spatial resolution of the Lake Pátzcuaro study, cores from other nearby lakes indicate a significant increase in sediment accumulation after 4,000–3,000 years BP[3-6]. The evidence from the crater lake La Piscina de Yuriria, Guanajuato[6,7], is particularly clear. In parallel with Lake Pátzcuaro, this lake has experienced three phases of accelerated erosion since the advent of maize cultivation. Its diatom and sediment chemistry records, which have century-scale resolution, indicate that in each case accelerated erosion began under wet conditions and terminated after the onset of dry ones. Under natural conditions of closed pine/oak forest with good ground cover, it seems unlikely that an increase in annual rainfall would enhance erosion rates. The opposite is more probable. We have therefore argued[7] that the relationship between climate and sediment yield in this area was modulated by climatically driven fluctuations in the northern frontier of summer-rain-fed agriculture.

Vita-Finzi suggests that changes in the seasonality of precipitation might provide an explanation for increased erosion. Although Lake Pátzcuaro receives very little winter precipitation at present, during the LGM, suppression of the summer monsoon coupled with an increased incidence of *nortes* (cold polar outbreaks) may have resulted in increased winter rainfall. The palaeolimnological record from Lake Pátzcuaro, however, indicates that at this time the lake was clear, acid and unproductive with a low input of sediment from the juniper–sagebrush steppe on the surrounding slopes. There is no evidence from Lake Pátzcuaro, or indeed from any other central Mexican lakes that we have investigated, to suggest that climatic change has had a significant, direct impact on erosion rates.

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