

immunological responses initiated by the trypanosomes themselves are involved in red cell lysis (Tabel).

Following the initial infection, pathogenic changes occur so rapidly that it is almost impossible to unravel those that result directly from the presence of the parasites from those resulting from the hosts' attempts to compensate for damage caused by anaemia and immunological responses to parasite and possibly host antigens. Nevertheless, the disease has many of the characteristics of an inflammatory one and P. F. L. Boreham (Imperial College, London) postulates that antibody-antigen complexes initiate a series of reactions leading to the activation of kallikrein and eventually increased capillary permeability on one hand and disseminated intravascular coagulation on the other. These effects, and the anaemia, are only part of the whole pattern of pathogenesis and virtually every kind of cell (M. G. Maxie & V. E. O. Valli, University of Guelph), tissue (W. I. Morrison & M. Murray, ILRAD, Nairobi) and organ (Valli) may be involved. The dynamics of the various changes can now be determined very accurately using a number of tracer and radioactive labelling techniques (J. D. Dargie, FAO/IAEA, Vienna) and these techniques will become increasingly useful in the next stage of unravelling the various intertwined reactions.

No conference on trypanosomiasis could be complete without some consideration of the ways in which meat-producing animals can be kept in regions of endemic trypanosomiasis. The possibility of using cattle tolerant to trypanosomiasis is not an immediate one as carefully controlled studies have now shown that the reputed trypanotolerant breeds like the N'dama do suffer considerably from trypanosomiasis although not as much as Zebu (Murray, Dargie) but much more quantitative work is required on this subject. On the other hand, young cattle do not seem to suffer so severely from trypanosomiasis as do adults (B. T. Welde, Walter Reed Institute Washington) and eland that can be bred in captivity do seem to recover from infection (R. Olubayo, Veterinary Research Laboratory, Kabete, Kenya). Perhaps we should acknowledge the supremacy of the tsetse fly at least temporarily and turn our attention to less popular breeds of cattle and alternative meat-producing animals which will eventually be able to live in Africa together with the tsetse fly and the trypanosomes but in the absence of clinical trypanosomiasis. □

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Pacific quiet zone contracted

from Peter J. Smith

LARGE-amplitude linear magnetic anomalies have now been used to interpret vast areas of the Earth's ocean floor in terms of plate tectonic processes. But there are still gaps; there are still difficulties in some areas, not least in the western Pacific. The late Mesozoic pattern of magnetic lineations in this region was first unravelled by Larson and Chace (*Geol. Soc. Am. Bull.*, **83**, 3627; 1972) who traced seafloor spreading back to the early Cretaceous and later to 153 million years (see, for example, Larson & Hilde *J. geophys. Res.*, **80**, 2586; 1975). But beyond that, in both temporal and geographical senses, there is a large zone of low-amplitude (<100 γ) anomalies, known as the Pacific Jurassic quiet zone (PJQZ), surrounding the Mariana Basin.

Whatever the cause of the PJQZ, its existence has impeded the resolution of the area's tectonic history and may have led to unnecessarily forced interpretations. For example, Hilde *et al.* (*Tectonophys.*, **38**, 145; 1977) suggested that the Mariana Basin may be underlain by Cretaceous crust formed during the better-documented Cretaceous magnetically quiet period—a proposal which implies, of course, that the basin originated during a time of intraplate spreading about 100 million years ago. In other words, by this interpretation, the magnetic anomalies in the western Pacific get older and older until they reach the PJQZ boundary at 153 million years, beyond which the lithosphere is younger.

This is possible, but unlikely. Moreover, as Cande *et al.* now suggest (*Earth planet. Sci. Lett.*, **41**, 434; 1978), such contorted theorising is unnecessary. Cande and his colleagues show (from existing data) that in the PJQZ, immediately beyond the 153 million year line, the magnetic anomalies are apparently no different in character and lineation, but differ only in amplitude, from those on the younger side of the line. It is necessary to say 'apparently' here because it is just possible that the older alternating positive and negative anomalies are not the result of field reversal at all but of field magnitude fluctuations within a single polarity; and certainly the observed anomalies may be modelled successfully on either assumption. But just as there is no doubt that the anomalies younger than 153 million years are produced by a combination of seafloor spreading and geomagnetic field reversal, there is little reason to suspect that the older

anomalies are not produced likewise. Cande *et al.* have thus been able to extend the Mesozoic polarity-time scale, temporally about 5 million years beyond the previous limit of 153 million years and geographically closer in towards the Mariana Basin from three different directions.

On this basis the field reversal rate during those 5 million years within the PJQZ was calculated to be once about every 100,000 years. But if the 153 million year boundary has no significance in terms of field reversal, seafloor spreading and the shape of the resultant magnetic anomalies, why is there a PJQZ at all? The first thing to be said about this is that the PJQZ boundary is not as sharp as it is sometimes imagined; there is no sudden change in anomaly amplitude at 153 million years. In fact, the amplitude begins to decrease somewhere around 140 million years and continues to do so fairly smoothly up to 155–160 million years. Or to rephrase this in forward time terms, from 160 to 140 million years ago the anomaly amplitude in the western Pacific increased fairly smoothly, actually by a factor of about four.

This increase in amplitude could have been due to a real increase in the magnitude of the geomagnetic dipole moment. Alternatively, it could have been the result of a gradual decrease in the frequency of (undetected) short polarity events, the presence of which would give an apparent reduction in the amplitudes of the observed anomalies. On the basis of the small-scale magnetic detail observed in the profiles from the faster-spreading sections of the western Pacific, Cande and his colleagues conclude that the first of these explanations is the most likely. Either way, the field of uncertainty in the western Pacific has been reduced, and in such a way as to suggest that further reduction may soon be possible. □

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A hundred years ago

At the last meeting of the French Geographical Society a letter was read from the Abbé Desgodins, dated Yerkalo, August 27, 1878, in which he states that, contrary to the common assertion which represents the sheep as the beast of burden most used in Thibet, this function belongs in preference to the yak (*Bos grussiens*); the mule, ass, and horse are also made use of.

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