he and McElhinny (*Geophys. J.*, **39**, 571; 1974) have now returned. An up-to-date analysis of 291 worldwide late Tertiary and Quaternary palaeomagnetic pole positions confirms the phenomenon of far-sidedness and also suggests that poles tend to lie to the right of the geographical pole when seen from the observing site. The revised figure for the average northward offset of the dipole for the past 25 million years is 325 ± 57 km (standard error), but there are now enough data available for them to be divided into smaller sets. The dipole offsets for the periods 25–7, 7–2 and 2–0 million years are 555 km, 316 km and 143 km, respectively, showing that the axial dipole has been moving gradually towards the geocentre.

On this occasion, Wilson and McElhinny did not consider the normal and reversed data separately, so it is not yet possible to say whether the time-averaged differential offset indicated by the Soviet results is valid on a worldwide basis or not. Looking at a shorter time scale, however, the whole question of polarity states and reversals continues to exercise the apparatus of the mind and the laboratory in a variety of ways. Aldridge and Jacobs (*J. geophys. Res.*, **79**, 4944; 1974), for example, have constructed mortality curves for each normal and reversed phase of the Earth's magnetic field over the past 45 million years and find that they differ from a simple exponential distribution for the lifetime of the phases. It is possible, of course, that the distribution should not be exponential anyway. But Aldridge and Jacobs consider it more likely that the observed departures from an exponential form arise from short polarity events that have not yet been detected —a conclusion similar to that reached, albeit in different ways, by several others beginning with Cox (*J. geophys. Res.*, **73**, 3247; 1968).

The ratio of the number of real polarity phases to the number of those actually observed so far is apparently about 2. This indicates an appreciable number of reversals remaining to be discovered, and may go a long way towards explaining the prevailing confusion over the identification of short polarity events. As Noël and Tarling point out on page 705 of this issue of *Nature*, for example, the so-called Laschamp event has been detected in at least 12 localities at reported ages ranging from 7,000 to 17,000 years. But are all the claims for the recognition of the Laschamp valid, or are there really two or more events involved here? And what is an 'event' anyway? Some years ago a polarity event was defined as a short period ($<10^5$ years) of opposing polarity within a much longer polarity epoch. But McElhinny (*Palaeomagnetism and Plate Tectonics*; Cambridge University Press, 1973) has suggested that brief events such as the Laschamp may not be true reversals at all but only 'excursions' of the geomagnetic field—relatively short-term deviations of the palaeomagnetic pole beyond that reasonably attributable to normal secular variation but something less than a full 180° reversal. Indeed, some workers, such as Freed and Healy (*Earth planet. Sci. Lett.*, **24**, 99; 1974), have already taken to referring to the 'Laschamp excursion'.

But how do field excursions arise? (They are known to occur, irrespective of whether or not the Laschamp event is one of them.) Possible causes are a tipping of the dipole towards the equator or a reduction in dipole strength which would allow the non-dipole field components to predominate. The latter is perhaps the more likely; and in this connection it may be significant that Aldridge and Jacobs mention dipole strength as possibilities for their missing events, that Cande and Labreque (*Nature*, **247**, 26; 1974) offer field intensity fluctuations as a possible explanation of the small scale magnetic lineations recorded over the North Pacific floor by deep tow magnetometers, and that Greenewalt and Taylor (*J. Geophys. Res.*, **79**, 4401; 1974) claim that low magnetisation blocks detected in the mid-Atlantic ridge "could represent actual periods when oceanic crust was generated during a time of significantly reduced main field strength". In short, there are clear suggestions that dipole fluctuations may account for several phenomena which are otherwise difficult to explain.

Which brings matters to one of the most intractable of all palaeomagnetic problems—that of how to determine the strength of the ancient geomagnetic field and plot its variation, if any, with time. There are two main difficulties here. The first is that although a palaeomagnetic direction may be obtained from a rock just as long as a measurable amount of the primary magnetisation remains, a palaeomagnetic field intensity may generally only be determined if the proportion of primary magnetisation remaining is known. It seldom is, although ways are available of mitigating the problem in certain cases. The second difficulty is that the obvious ways of obtaining a palaeofield from a rock containing thermoremanent magnetisation require that the rock be heated above its Curie point, a process likely to alter the magnetic minerals either physically or chemically. Clearly it would be desirable to have a method of determining ancient field intensities which could either be applied at room temperature or, if heating is necessary, would enable any alteration in the rock to be avoided or estimated. Curiously, three possible candidates have appeared almost simultaneously, all of them involving anhysteretic remanent magnetisation (ARM). The most satisfactory appears to be Shaw's (*Geophys. J.*, **39**, 133; 1974), a method which does not eliminate heating but which permits selection of a coercive force region within which the heating has not changed the magnetic properties. Banerjee's method (*Earth planet. Sci. Lett.*, **23**, 177; 1974) requires a single heating but is claimed to be preferable to those methods requiring repeated heatings; and the technique described by Stephenson and Collinson (*Earth planet. Sci. Lett.*, **23**, 220, 1974) involves no direct heating but requires the assumption that parameters relating to some rocks are also valid for others. No method is completely problem-free.

Finally, it must be said that this discussion of recent work on the palaeomagnetic field is far from exhaustive. During the past few months Georgi (*Geophys. J.*, **39**, 71; 1974) has presented a spherical harmonic analysis of palaeomagnetic inclination data, Baag and Helsley (*J. geophys. Res.*, **79**, 4918 and 4923; 1974) have constructed a new geomagnetic secular variation model and carried out a shape analysis of palaeosecular variation data, Creer (*Earth planet. Sci. Lett.*, **23**, 34; 1974) has determined geomagnetic variation recorded in a Black Sea sediment core 7,000–25,000 years old . . . and so on. Statistical anomaly or new commitment?

NATURE

A hundred years ago

THE fitting of the Arctic ships *Alert* and *Discovery* is making rapid progress at Portsmouth, in the hands of the dockyard shipwrights, who are working extra hours, in order that they may be rigged and out of their hands by the 12th of April. The sledges have all been made, and the tents are in progress. Meanwhile the officers are pursuing their special studies. We understand that Commander Markham, and Lieutenants Archer, Giffard and Fulford are going through a course of instruction in magnetism. Lieutenants Parr and May are to be initiated into some special astronomical work, and two other lieutenants will receive charge of the pendulum observations. The work connected with spectrum analysis will also be provided for, and one or more of the officers will take up photography. The ships will be commissioned in the middle of April, and will sail early in June.

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