NEWS AND VIEWS

Magnetic-Faunal Boundaries

from a Geophysics Correspondent

EVER since Uffen (*Nature*, **198**, 143; 1963) suggested that removal of the geomagnetic field would produce an increase in ionizing radiation at the Earth's surface, thereby affecting the evolution of organisms, the problem of faunal extinction at field polarity transitions has rested in confusion. Uffen's argument was essentially that, if during a geomagnetic polarity reversal the field strength passes through zero, the Earth will no longer be shielded from sterilizing cosmic rays, the Solar Wind and particles trapped in radiation belts. These will then be free to bathe the Earth and thus produce drastic changes in mutation rates.

Two years later, Sagan (*Nature*, **206**, 448; 1965) observed that even in the absence of the geomagnetic field, atmospheric absorption would remove most of the harmful radiation; but by this time Harrison and Funnell (*Nature*, **204**, 566; 1964) had discovered that the most recent reversal coincided with a faunal boundary in deep sea cores. In the light of subsequent research we may now say that there is a close correlation between the Brunhes-Matuyama magnetic boundary and the χ - ψ Radiolaria boundary.

Confusion arose through the conflict between Uffen's and Sagan's ideas together with a lack of precise knowledge of the magnitude of the radiation increase during a reversal, or the effect this increase would have on organisms. In the past few months, three important papers have appeared independently, each of which indicates that faunal extinction cannot be related to known sources of radiation because the increase in such radiation during a field reversal is extremely small.

In the first of these papers, Waddington (*Science*, **158**, 913; 1967) notes, after Sagan, that few primary particles impinging on the upper atmosphere will avoid nuclear interaction; and so any increase in radiation dose at sea level will be due entirely to secondary particles. On this basis, he calculates that removal of the geomagnetic field will increase the secondary cosmic ray dosage by a maximum of only six mrad/year and the dosage of isotopes produced by cosmic rays and the Solar Wind by less than two mrad/year. Each of these is negligible compared with normal background radiation. Furthermore, there will be little or no increase in Antarctic latitudes, from which regions most of the deep sea cores exhibiting faunal extinction coincident with the latest reversal boundary have come. The effect of the dumping of radiation belt particles will also be negligible because this process will occur only slowly as the magnetic field gradually weakens.

In the third paper to appear, Harrison (*Nature*, **217**, 46; 1968) reaches essentially the same con-

clusions as Waddington. In addition, however, he points to recent work of King and Kohl and of King-Hele and Allan, which indicates that certain meteorological phenomena may be partially controlled by the geomagnetic field. The suggestion is that climatic change may be the causal intermediary between geomagnetic field reversals and faunal extinction, although Harrison admits that at the present time this hypothesis rests on insufficient evidence.

The most impressive of the three contributions, however, is that of Black (*Earth and Planet. Sci. Letters*, **3**, 225; 1967). In an excellent paper, this author considers, quantitatively and in detail, the effects of cosmic rays, radiation from solar flares, the dumping of Van Allen belt particles, exposure of the Earth to the Solar Wind and the production of radioisotopes from the various radiation sources. In each case, increased dosages during a polarity transition are shown to be negligible, and thus incapable of drastically affecting evolution—least of all, causing faunal extinction. Even the increase in the concentration of ozone produced by the impact of the Solar Wind on the upper atmosphere is extremely small. At least one source of climatic modification during a reversal is thus eliminated.

In his conclusion, moreover, Black raises a significant general point. He asks, in effect, whether there really is a causal magnetic-faunal boundary correlation. In only one case, the Brunhes-Matuyama boundary, has a correlation been proved. In a second case, the beginning of the Olduvai event, a correlation has been suggested by some workers but not confirmed by others. Further, at least one of the faunal boundaries within the period covered by the last nine reversals lies away from any magnetic boundary. If both the faunal and magnetic boundaries are distributed randomly in time, the probability of one coincidence within 10,000 years is ten per cent, but falls to one per cent for two coincidences. Until a second correlation is confirmed, therefore, the first may only be a "coincidence" in the more colloquial sense of the word.

A DNA Restriction Enzyme

from our Cell Biology Correspondent

IN this issue of *Nature* (see page 1110) Meselson and Yuan report the isolation and partial purification, from *E. coli* strain K, of an intriguing enzyme, endonuclease III-K. This enzyme can recognize and degrade foreign DNA introduced into the cell either as a bacteriophage genome or during abortive mating with another strain of *E. coli*. In other words the