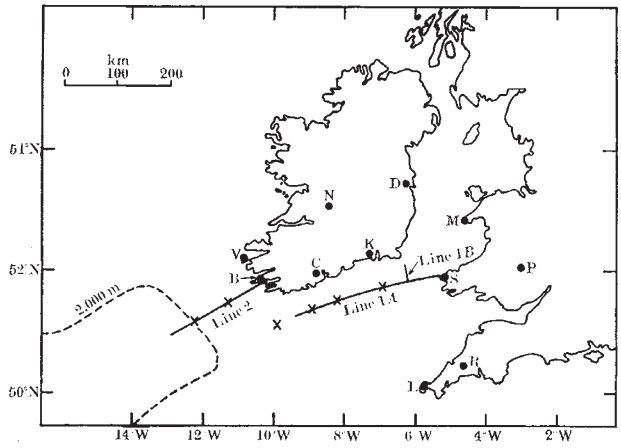
of the inclination values (about one hundred per core) about the arithmetic mean inclination of each core was less than 15°. Magnetic inclinations of the cores, all samples from which were magnetically cleaned, ranged from 0° to 73°.

Plots of inclination against latitude of core location for both the Brunhes and Matuyama core sections fitted the inclination–latitude variation expected for an axial dipole. The dipole best fitting the inclination data was calculated to have its northern pole at 89° N, 211° E—a position which compares favourably with that of 88·4° N, 279·5° E deduced from Plio-Pleistocene continental rocks. The deviation of 1° or so from the geographic pole is not significant when measurement errors are taken into account. Standard deviations about the relevant Quaternary poles then compare as in the table.

It is clear that ocean core inclination data are more consistent with an axial dipole than with either the present inclined magnetic dipole or the inclined dipole deduced by Doell and Cox from Hawaiian lavas. The evidence for the reality of a chiefly axial dipole field during the Brunhes and Matuyama epochs is thus strong. It should be remembered, however, that these epochs represent a very small fraction of geological time. Most continental drift took place before the beginning of the Matuyama epoch where the dipole hypothesis has still not been confirmed.




Continental margin seismic refraction experiment, 1969. Shots will be fired from HMS Hecla along the three lines, 1A, 1B and 2. (O) Land seismometer stations to be operated by scientists from the Universities of Birmingham, Dublin, Durham and Leicester, University College Swansea, the Institute of Geological Sciences (Edinburgh) and the UKAEA Seismological Laboratories. B, Castletown Bere, Bantry Bay; R, Cardinham Moor near Bodmin; L, Land's End; K, Waterford; N, Nenagh; D, Dunsink; S, St David's; M, Myndd Anelog; C, Cork; P, Painscastle; V, Valencia. In addition sonar buoy equipment (X) will be used to measure seismic arrivals aboard the RV Prince Madog (University College Bangor) and the RRS John Murray.

EARTH'S CRUST

# Continental Margin Survey

An impressive seismic experiment to obtain a profile of the Earth's crust across the continental shelf and margin south of Ireland is planned for September. With six universities, the Institute of Geological Sciences (Edinburgh) and the UK Atomic Energy Authority Seismological Laboratories (Blacknest) taking part, it also promises to set some sort of record for geophysical cooperation in Britain. Apart from the limited data obtained from crustal surveys in the Irish Sea in 1965 and in south-west England in 1966, very little is known about the crustal structure under and around Britain.

The plan is to fire seventy 300 pound depth charges from HMS Hecla, the Hydrographic Department's 2,800 ton survey ship, along three lines (see map). The first of these follows a course a few degrees south of west from Pembrokeshire (line 1*A*), the second travels approximately south-west from Bantry Bay in Ireland to the western margin of the continental shelf (line 2), and the third (line 1*B*) forms a short perpendicular arm to line 1*A*. The shots, which will be exploded either on the sea bed or in water at a depth of 150 metres, will be recorded on HMS Hecla, and shot times will be broadcast to seismic recording stations. In case broadcasts are not received, HMS Hecla and each station will also record the seismic signal against its own time signal, and the latter will be calibrated against BBC Radio 2. Shot separation will generally be ten kilometres in distance and thirty minutes in time. Line 1*A*, however, includes three three-kilometre/fifteen minute sections which will be used to measure seismic velocities in the various refracting layers. One of these close-group sections also forms an L array with line 1*B*. This should give information on the seismic velocity of the upper mantle and any possible horizontal anisotropy.

The seismometer stations themselves will be set up at suitable distances to receive seismic waves refracted from each of the principal crustal boundaries and the Mohorovicic discontinuity. This is where the chief collaboration comes in. In charge of the coordination of the whole experiment is Dr Derek Blundell of the University of Birmingham. Eleven seismometer stations will be set up on land, the responsibility for these being divided between seven groups of scientists, each from a different institution. In addition, sonar buoy equipment will be used to record seismic arrivals aboard the RV Prince Madog; and a team of seven scientists led by Dr Blundell will make similar measurements aboard the RRS John Murray. When the main crustal experiment is complete, Dr Blundell's team will continue to carry out seismic, gravity and magnetic surveys across the Nymphe Bank, south of Ireland, to obtain more detailed information about the shallower crustal layers.

The result of all this activity should be a greater understanding of the evolution of the Atlantic Ocean. For example, if continental drift has occurred during the past 150 million years with Europe and America spreading apart, Ireland should once have been joined to Newfoundland. Evidence for this juxtaposition may come from a comparison of the new results with the better known crustal structure of Newfoundland. The geophysical survey across the Nymphe Bank will attempt to trace westwards the geological structures found in the Cardigan Bay area which attracted the attention of the oil companies. But Dr Blundell is not too confident of finding more sedimentary basins such as the one in Cardigan Bay, and is quick to point out that the project is primarily scientific rather than commercial.