SEAFLOOR SPREADING

Direct Measurement

from our Geomagnetism Correspondent

ON the face of it the direct measurement of the rate of seafloor spreading is an unlikely activity bearing in mind that most of the spreading material is inaccessible, that spreading rates are low and thus that on the oceanic scale the absolute distance of spreading is small even within the human life span. But because of its position astride the mid-Atlantic Ridge Iceland offers a unique opportunity for the direct determination of spreading rate—or at least something closely akin to it—when combined with modern methods of distance measurement. Decker *et al.* (*Science*, **173**, 530; 1971) have now reported the results of just such an experiment to measure the extent of rifting between 1967 and 1970 within the rift zones of Iceland.

During 1967 fifty-eight survey lines, making up a total distance of about 157 km, were measured with a geodimeter. Most of these lines were joined to form two profiles, one across the eastern rift zone and one across the Thingvellir zone, although two, used as calibration lines, lay outside the rift zones in an aseismic area of Tertiary volcanics near the west coast. Seventeen of the survey lines were then remeasured in 1970. A different geodimeter was used here; but systematic errors between the two instruments were resolved by reference to the calibration lines. All of the remeasured lines had apparently increased in length between 1967 and 1970 by distances ranging from 6 to 45 mm. After taking account of an 18 millimetre cross-instrumental difference the lines were found to have lengthened on average by (20 ± 2) millimetres where the quoted error is the standard error of the mean.

The problem with this sort of thing is, of course, that, notwithstanding the sophistication of modern equipment, errors are likely to be large and not easily assessed; and random errors are likely to be particularly troublesome. So how much of the apparent lengthening is random error and how much represents a real extension of the rift zone? Random errors of measurement for eighty repeated observations made in 1967 and for forty-five repeated observations made in 1970 have a normal distribution with a standard deviation of 5.7 mm. Previous experience in California and Hawaii shows such a standard deviation to be reasonable for lines 2 km long; and this is, of course, much less than the 20 mm average lengthening observed. Moreover, various statistical tests carried out by Decker *et al.* indicated extremely low probabilities for the pattern of extensions from line to line within the profiles to have arisen by chance. Accordingly, the net apparent extension of the eastern rift zone profile between 1967 and 1970 was calculated to be (65 ± 31) millimetres, or about 2 cm a year on average. By contrast, the Thingvellir lines showed an average contraction of 2 mm but this was well within the expected errors of measurement.

Is it possible to use this data to determine the nature of rifting in Iceland? Einarsson (*J. Geophys. Res.*, **73**, 7561; 1968) noted the en echelon pattern of rift fractures and related it to shear motions paralleling the rift zones; and in one sense the new data could be taken to support this view. In the eastern rift profile the first three and last lines indicated a net contraction whereas the middle seven gave a net extension (giving an overall net extension). This situation could arise from left-lateral shear movements; but Einarsson had already concluded (*Soc. Sci. Isl.*, **38**, 128; 1967) that the en echelon pattern of fractures near Hekla was caused by right-lateral shear. Einarsson's interpretation and the Decker data are thus inconsistent; and this has led Decker and his colleagues to support the alternative interpretation of Icelandic rifting put forward by Bödvarsson and Walker (*Geophys. J.*, **8**, 285; 1964) in which the rifts are related to crustal extension perpendicular to the strike of the fractures. In this case the measured extension of the eastern rift zone is explicable without complication.

BIOLOGICAL MATERIALS

Standardized Standards

PREPARATIONS of a variety of biological materials are now available free of charge from the National Institute of Medical Research in London, for use as standards to define units of activity or as reference materials. The substances, which are not for human consumption, include angiotensin, antilymphocyte serum and interform, and are available to scientists in any country.

Unambiguous standard units, which define the biological activity of a compound, have been adopted internationally to ensure that experimental results can be meaningfully communicated among research groups throughout the world. Many units can be defined on paper; for example, enzymatic activity is expressed as the amount of reaction product formed in unit time in precisely described physical and chemical conditions. The activities of other substances, however, cannot be completely characterized by physical and chemical means.

This problem has been overcome by the Expert Committee on Biological Standardization of the World Health Organization, which has established reference preparations for substances used in the prophylaxis, diagnosis and treatment of human and animal diseases, so that their potency can be expressed in uniform terms throughout the world. These preparations are distributed free of charge by the World Health Organization to member countries, and scientists may receive them on request. Further information about this service can be obtained from the WHO International Laboratory for Biological Standards, NIMR, Mill Hill, London NW7 1AA. NIMR also has limited quantities of hormones and antisera, for use in immunoassays, which are available only to people working in the United Kingdom.

These biological standards are intended for calibration, by comparative assay, of the potency of existing national and laboratory standards and are not intended for administration to humans or for general experimental purposes. The list of substances available in reference ampoules ranges widely from pituitary hormones to insulin and immunoglobulins.

Microwave Molecular Line Astronomy

IN next Monday's *Nature Physical Science*, David Buhl and Lewis Snyder describe the techniques and antennae used by the NRAO's group at Green Bank, West Virginia in the study of molecular lines originating in interstellar space at millimetre and centimetre wavelengths. The interstellar environment provides a unique set of "laboratory" conditions with very low temperatures and densities in clouds travelling at high velocity and occupying regions several light years across so that these observations are of interest to chemists and physicists as well as astronomers.

Tiny dust particles in the gas clouds provide surfaces on which chemical reactions can take place, and the discovery so far of twenty-one molecules in space has been a great stimulus to the development of radio astronomy in recent years.

The most exciting aspect of this work has been the discovery of many organic molecules, including those of formaldehyde, hydrogen cyanide and cyanoacetylene, which are of great biological significance. Now the field has developed to such an extent that increased sensitivity from improved instrumentation seems likely to provide the means for the detection of weaker lines and for the resolution of known clouds at frequencies corresponding to the stronger known lines to an accuracy of better than one arc minute.