and too general to satisfy the requirements of many users". All maps like this, based as they are on the seismic history of the area, are necessarily open to such criticisms. They reveal areas of high seismic activity but do not predict what engineers want to know—the short term probability of a major earthquake at any particular site. As a result, there is always a conflict of interest between seismologists, who tend to overestimate the risk to be on the safe side, and engineers, who tend to underemphasize the risk. The new map, like its predecessors, is only a general guide providing information for land planning on a very broad scale.

OCEANOGRAPHY

Discussing the Irish Sea

from a Correspondent

ONE hundred and fifty scientists attended a Royal Society Discussion Meeting on the Irish Sea held at the society's rooms in London on January 14–15. For the purposes of the meeting the area under discussion was taken to be a line drawn between St David's Head and Cawnsore Point in the south, and Stranraer and Larne in the north. The papers presented ranged in scale and diversity of subject from considerations of the general circulation of the region to the distribution of foraminifera in part of Cardigan Bay. They were concerned chiefly with research projects recently completed but not yet fully reported, or with proposed programmes of work for the immediate future.

Most of the first day was taken up with the physical and chemical oceanography of the region. A feature of these sessions was the extent to which new measuring techniques are likely to make good in the short term the lack of detailed data that has held back our understanding of the dynamics of not only the Irish Sea, but of all seas and oceans. Thus there was a report of the first results obtained in this region with networks of moored recording current meters and of an instrument which gives a continuous measure of salinity and temperature according to depth when lowered from a ship. But a report of changes in the distribution of two zooplankton "indicators" of water movement suggested that progress in understanding fully the week by week changes in the physical state of this relatively small sea area might be very gradual.

The second day of the discussion was devoted to the geology and sediment distribution of the region and to papers dealing with various biological problems and programmes. One of the speakers described the Irish Sea as "a great natural laboratory", an idea which was echoed by others. The relatively small geographical extent and proximity of this sea to Britain has meant that such topics as moving fields of sand waves and the plaice population, for example, associated with a particular spawning ground could be studied with only some of the normal inconveniences that marine scientists have to contend with.

Another theme running through the papers and the discussions following them was the need for cooperation, not only between the various disciplines but also between the different types of organization engaged in this sort of research. Scientists at the many universities with research projects in the Irish Sea were urged to note that relatively small scale studies in the bays and shallows, for example, might yield important

information about the food chains of fish which would be of national economic importance. Government research laboratories, on the other hand, were asked to make their collections of detailed data generally available as soon as possible. All, it was suggested, ought to face together the prospect of growing pollution problems associated with the cities, towns and industries found on the coasts of this region.

LUNAR MAGNETISM

Is the Moon Magnetic?

from our Geomagnetism Correspondent

SEVERAL of the research proposals accepted by NASA, for examination of the Moon rock to be returned to Earth by Apollo II, envisage study of the rock's remanent magnetism. The success of these investigations will depend on whether, in fact, the Moon possessed a magnetic field either at the time the rocks were formed or for some subsequent, appreciable period. Evidence for the existence of an ancient lunar field can only lie in the rocks themselves; but insofar as the present is the key to the past, the signs are not too hopeful.

The first attempt to detect the Moon's magnetic field directly was made in 1959 by Luna 2, whose magnetometer functioned down to 55 kilometres from the lunar surface (Dolginov *et al.*, *Geomag. Aeron.*, **1**, 18; 1961). No field was observed, which meant, taking into account the limiting sensitivity of the magnetometer, an upper limit of 6×10^{21} gauss cm³ on the lunar magnetic moment. This result remained current until July 22, 1967, when the US Explorer 35 was placed in lunar orbit carrying two magnetometers. Initial results from the first of these, sponsored by the Goddard Space Flight Center, showed that, unlike the Earth, the Moon does not trap interplanetary field lines to form a magnetosphere, and thus enabled the maximum lunar moment to be reduced to 4×10^{20} gauss cm³. The second, sponsored by the Ames Research Center, yielded a maximum moment, for a dipole aligned with the lunar axis, of 6×10^{20} gauss cm³—or 7×10^{-6} that of the Earth (Ness *et al.*, *J. Geophys. Res.*, **72**, 5769; 1967 and **73**, 3421; 1968).

A more detailed analysis of the Explorer 35 data now carried out by Behannon (*J. Geophys. Res.*, **73**, 7257; 1968) yields a still lower upper limit for the lunar magnetic moment. The principal reason for the greater refinement of the new result is that analysis has been confined to data obtained during the Moon's passage through the Earth's magnetic "tail" where previous satellite measurements have shown the ambient field to be steady in both magnitude and direction. The average total field for twelve Explorer 35 runs lasting more than three hours was 10.3γ , whereas the geomagnetic tail gradient observations of the previous Explorer 33 predict an ambient field of $9-10\gamma$ at the appropriate point in the tail. The lunar field due to both permanent and induced magnetization was thus less than 2γ . Separate analysis indicated a maximum field of 1γ for each type of magnetization, which yielded a new upper limit of 1×10^{20} gauss cm³ for the Moon's permanent magnetic moment.

These data give no definite assurance that the Moon has never possessed an appreciable magnetic moment and hence a molten core. But cause for doubt arises chiefly from a comparison of the present lunar field