wide stripes. But the depression of sensitivity measured on a grating three times nearer corresponded to stripes which looked (and were) three times narrower. The authors conclude that neurones sensitive to spatial frequency are involved in estimating the size of visual stimuli, and that, in the visual system, these neurones operate before a mechanism which scales for size according to estimated distance.

This kind of conclusion does, of course, require an argument containing several more or less precarious steps. It is not certain, for instance, that the apparent selectivity of human observers for sinusoidal gratings of specific spatial frequency does indicate that spatial frequency analysis corresponds directly to an analysis of size. But what is certain is that, although microelectrode experiments have allowed an enormous advance in the understanding of how neuronal mechanisms operate, their *modus operandi* in perception will only be understood by comparing these experiments with psychological results. The adaptation technique may be just what is required to pick the human visual system apart in a bloodless manner, and to reach an understanding of the detailed series of operations on which perception is based.

LIQUID HELIUM

Vortex Ring Detector?

from a Correspondent

THE experiment of Gamota and Barmatz (*Phys. Rev. Lett.*, **22**, 874; 1969) did not, as had been supposed, measure the impulse of a beam of quantized vortex rings, according to a recent paper by Huggins (*Phys. Rev. Lett.*, **29**, 1067; 1972).

At the temperature of 0.3 K at which the experiment was conducted, liquid ^{4}He is almost entirely composed of superfluid, which means that macroscopic objects or excitations such as vortex rings can move through the liquid without being subject to any dissipative forces: the viscosity is essentially zero. A vortex line consists of a cylindrical core which may or may not be hollow, surrounded by rotating fluid whose tangential velocity at any point is inversely proportional to its distance from the axis; and a vortex ring consists of a vortex line whose ends have been bent round and joined up to give a toroidal shape. As each side of the ring is subject to the velocity field of the other, it is clear that the ring will have an intrinsic velocity through the surrounding fluid which depends only on its diameter and the magnitude of the circulation (which is a measure of how fast the fluid rotates about the core).

A smoke ring is a familiar classical example of a vortex ring, but rings in superfluid helium differ from their classical counterparts in that the circulation is (singly) quantized. Much of the importance attached to studies of vortex motion arises from this quantization, which implies that any element of superfluid vortex is identical to any other. Indeed, the most convincing determination of the quantum of circulation was carried out simply by studying the relationship between energy and velocity for large vortex rings. Both positive and negative ions are very strongly attracted to the cores of vortices; and an ion accelerated to a sufficient velocity in the superfluid will actually create a charged vortex ring, which is how vortex rings are usually prepared experimentally. Before the Gamota–Barmatz experiment the arrival of a beam of vortex rings was always detected by means of the minute electric current which they carried (typically 10^{-13} A).

Gamota and Barmatz set out to try to detect the arrival of a beam of charged rings not by using their charges, but by measuring their momentum impulse, which, it was hoped, would give rise to a tiny but measurable force on a plate mounted perpendicular to the beam. They arranged for the beam of rings to impinge on a very thin flexible plastic diaphragm, metallized on one side, which formed one half of a parallel plate capacitor, and then looked for small changes in capacitance as the beam was switched on or off. Changes in capacitance, proportional as expected to the areas of individual rings forming the beam, were indeed observed, and the experiment was hailed as the first demonstration of a vortex ring detector which did not depend on the charges carried by the rings.

As the formation of uncharged rings had been postulated by several people to explain some very interesting macroscopic quantal phenomena occurring in superfluid flow near orifices, the detector seemed to have immediate application in checking their theories. But doubts soon emerged. Vortex rings in a bounded fluid can be shown to carry no momentum, so that it is far from obvious that a ring will impart

Did the Highlands move Right or Left?

THOSE with a fancy for large scale tectonics may reach for their atlases when they have seen the reinterpretation of the Great Glen fault by Garson and Plant. In next Monday's *Nature Physical Science* (November 13) they suggest that the horizontal movement of the crust along this vertical fracture carried the crust north-west of the fault to the right, rather than to the left as Kennedy proposed in his revolutionary hypothesis a quarter of a century ago. Kennedy's interpretation of the Great Glen structure as a transcurrent fault was a master stroke. Not only did it indicate the magnitude of past horizontal movements, but, as Blackett has emphasized by demonstrating the reality of such movements, it encouraged physicists, new to the field, in their search for conclusive evidence of continental displacements.

E. M. Anderson pointed out at the reading of Kennedy's paper that the fault is probably part of a more extensive structure. Time has shown him to be right, and, as Garson and Plant indicate, it forms part of a largely Palaeozoic fault system, which, before the opening of the Atlantic, extended some 3,000 km from the Maritime Provinces of Canada to the Arctic. The British section, some 1,200 kilometres long, has been traced from the continental slope north-west of Ireland through the Great Glen and the Shetlands to a point on the slope north of that group of islands. The implication of their interpretation is that a piece of continental crust the size of England lying between the fault and the margin of the deep Atlantic has moved 100 km north-east relative to the rest of Britain.

Flinn, of Liverpool University, has done much to locate the course of the fault system north of the Scottish mainland, and it was his work in Shetland followed by his more recent analysis of the magnetic data provided by the Institute of Geological Sciences which first indicated large dextral displacements of the order of 60 km along the fault northwards for several hundred kilometres from the Moray Firth. Flinn, like Holgate, who had recognized dextral movement further to the southwest, was prepared to accept Kennedy's evidence that where the fault crossed the Scottish mainland the movement was principally sinistral. What Garson and Plant have now done is to suggest that when one considers the evidence along the length of the fault as a whole, everything combines to indicate a dextral displacement and that the time has come to abandon the original hypothesis. They go further than this and point out how such movements can be reconciled with an anti-clockwise rotation of Greenland and eastern Canada accompanied by a 3,000 km transcurrent fault system comparable in magnitude with the chief active faults of today. Before the opening of the Atlantic the sliver of European crust to the north-west of the Great Glen was, of course, joined to Greenland and Canada.