On the Anisotropy of the Cosmic Radiation.

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Summary. — An attempt has been made to reproduce some results of McCusker and his coworkers who had reported diurnal effects of cosmic ray showers. The design of the apparatus follows closely that of these workers, but allows more detailed information about each recorded event to be obtained. The main categories of observed events, including those examined by McCusker et al., show no significant diurnal variation. A possible sidereal diurnal variation of a particular group of events is critically examined, and it is concluded that, in spite of strong statistical weight, the implications of accepting the variation as physically real do not at present allow it to be regarded as such.

Many attempts have been made to determine whether an anisotropy of the cosmic radiation, apart from that imposed in the immediate neighbourhood of the earth, can be detected. Although for obvious reasons one would regard as most promising the study of the products of very energetic primaries, a number of workers who report some indication of anisotropy have been concerned with effects due to primaries of much lower energy. Notably, McCusker and his co-workers \(^{(1)}\) have presented evidence for the detection of a sidereal time variation of large amplitude, and hence a directional anisotropy of incident primaries, with a relatively simple counter arrangement sensitive to penetrating showers. Other workers, too, have reported similar, if smaller


effects, and the great difficulty in seeing any reasonable interpretation of these observations must be set against the fact that considerable agreement is to be found in such work regarding the phase of the possible sidereal variations.

The work reported here was prompted by the need for investigation of the large sidereal variation reported by McCusker and of the very large variation in solar time reported by him (2) by similarly simple counter arrangements. Data for 14 months are now available, and so a stage has been reached when significant statistical improvement will be slow; they are perhaps now of sufficient interest to justify this report.

The experiment is being carried out at Leeds. Following McCusker closely we use a penetrating shower detector of three trays of Geiger tubes (Fig. 1a). Each tray contains 9 counters of area 240 cm$^2$, and they are respectively shielded vertically by 30, 40 and 50 cm lead while there is 15 cm lead shielding at the sides. This unit is placed at the centre of a triangle (Fig. 1b) formed by three unshielded trays of counters each containing two of area 240 cm$^2$ and two of 35 cm$^2$ area. The discharge of every counter of the array is separately displayed, and the form of a penetrating event together with an estimate of the accompanying electron shower density may be obtained. The selection was made for penetrating showers, involving the discharge of at least two counters in each of the three shielded trays.

The hodoscope arrangement, enabling the discharge pattern to be examined, allowed different kinds of events to be distinguished. Some of these could be compared with observations of other workers, affording a useful check on overall operation; it was felt, too, that any anisotropy found to occur in events of any but extreme energy might belong not to a broad grouping of events, but rather to some small, but perhaps recognisable component. Accordingly, the rates of the separated components making up the total observed group of