morphous, and that, in addition, we find that KBr and KCN have nearly identical molecular volumes—43·1 and 42·8 respectively. Thus if CN replaces Br there is no appreciable change in volume, and we may conclude, tentatively, that the cyanogen radicle and the bromine atom have the same size."

Acting on the suggestion of Prof. W. L. Bragg, the writer has made X-ray examinations of small single crystals of KCN by the ordinary spectrometer method, and of powdered crystals by the modification of the method recently described by Sir W. H. Bragg before the Physical Society of London. The results of this preliminary investigation indicate that the underlying structure of KCN is similar to that of KBr, the cyanogen radicle replacing the bromine atom. For instance, the strongest reflection is that given by the [100] face at a glancing angle of 6° 15′. This corresponds to a distance of 3·27 Å. between the planes, and the calculated mass associated with the unit cube the edge of which is of this length is one-half of the mass of the KCN molecule; this is a characteristic of the face-centred lattice. The first-, second-, and third-order reflections from the [100] face have intensities which decrease in the normal way, although at a greater rate than is usually the case; the first-order reflection given by the [111] face at a glancing angle of 5° 40′ is relatively small, while the second-order reflection at 11° 30′ is normal, as is also the first-order reflection from the [110] face. These spectra correspond to those given by NaCl, where the unit of the structure consists of a cube with atoms of one kind arranged at the corners and face centres, and atoms of the other kind at the mid-points of the edges and at the cube centre.

The data obtained, while being sufficient to fix the position of the CN radicle as a whole with respect to the potassium atom, afford practically no evidence as to the disposition of the carbon and nitrogen atoms towards each other. So far as the lower orders of spectra are concerned, the CN radicle behaves as a single unit, whose power of diffracting X-rays differs from that of the potassium atom. The edge of the unit cube in the KCN crystal is 6·54 Å. Taking 4·15 Å. as the diameter of the potassium atom (Prof. W. L. Bragg, *Phil. Mag.*, August, 1920), this leaves 2·39 Å. as the width of the space, measured along the cube edge, to be filled by the CN radicle. The diameter of the bromine atom is 2·38 Å.

The results of the investigation will be published in detail elsewhere. P. A. COOPER.

Manchester University, July 28.

An Ornithological Problem.

STAYING this last week-end with a friend at Overstrand, I was much puzzled on the morning of August 6 by a strange bird which I first saw sitting on some low iron gates at the end of the lawn, when I took it for some kind of hawk. It then settled for a time on a croquet-hoop, and ultimately flew away, when its long wings and tail and smooth flight again suggested a hawk. My host, who had seen it before, thought it might be a cuckoo, and this, when a little later we saw it again in flight, seemed a probable solution.

We did not see the bird again until the evening of August 7, when during a heavy shower it appeared on the lawn and perched on a croquet-hoop close to the house. I then saw that its plumage was not grey-blue, like the adult cuckoo, but a rich mottled brown, and I began to think that it might be a nightjar, though its beak seemed a little too long and its appearance in a beautifully trim garden on the edge of the sea, in the daytime, out of character. Moreover, both on gate and croquet-hoop it sat crosswise, not lengthwise as the nightjar does on a branch. It also occasionally hopped, somewhat clumsily, across the lawn and regaled itself with a worm like any thrush.

On my return to town it was suggested to me that the bird might be a young cuckoo. It so happened that I had never seen one, and so was not aware how different the plumage is from that of the adult bird. After consulting the authorities, however, such as Dresser and Lilford, I am satisfied that this is the right solution, for the mottled brown plumage is quite in order, and the beak and the length of wings and tail are clearly more those of a cuckoo than of a nightjar. Moreover, we are expressly told that the cuckoo when on the ground hops in an ungainly fashion, whereas it is doubtful whether a nightjar with its peculiarly constructed feet could hop at all. The cuckoo, like the nightjar, is normally insectivorous, but this bird might have been brought up by a thrush and imitated its foster-parent's method of dealing with worms on a lawn. Presumably the young cuckoo is not ready for its long flight across sea so soon as the adult bird, of whom we read, "In August, go he must." GEORGE A. MACMILLAN.

August 9.

Uniform Motion in the Æther.

IT seems to be fairly generally conceded that uniform motion relative to the æther is, in principle, undetectable by optical devices. Poincaré, for instance, who did not entirely accept the positions of relativity, stated as his opinion that "optical phenomena only depend on the relative motions of the bodies concerned, and this not to quantities of the order of the square or cube of the aberration, *but rigorously.*"

A very simple consideration, however, shows that such a view is untenable. Thus, if we have a vertical mirror, with a horizontal motion in its own plane relative to the earth, and if a horizontal beam strikes it, the angles of incidence and reflection must, as measured from the moving mirror, be equal, for otherwise the measured discrepancy would determine the earth's motion.

Owing to the aberration, however, these apparently equal angles are not, in general, truly equal, nor are they equal as measured from the earth. It is only when the direction of the earth's motion is in the direction of the horizontal axis of the mirror that they will be equal when so measured.

This determines the direction of the earth's motion, and from the discrepancy in the other cases the magnitude of the velocity could be found.

An effect of the FitzGerald-Lorentz contraction would be to distort angles, so that, for example, a measured right angle, the bisector of which was in the direction of the earth's motion, would be greater than a true right angle; but this would not be compensatory in the case of the mirrors, and would itself, in another connection, serve to determine the earth's motion.

In fact, angular measurements of the stars would suffer discrepancies of a maximum of about 0·001″, in opposite directions, at intervals of three months, owing to the earth's motion in its orbit, and any added motion would probably be detected if an accuracy of 0·001″ in the measurement of large angular distances could be obtained.

As another example of a different kind, the simple immersion in still or moving water of the Michelson-Morley apparatus ought, theoretically, to give a positive result, since the water moves relatively to the æther, and Fizeau's law indicates that the velocity of light in moving water is not the same in all directions; while if the water moves relatively to the apparatus, this velocity is independent of the particular contractions of the latter. E. H. SYNGE.

Dublin.