TO THE EDITORS OF KNOWLEDGE.

SIRS,—With reference to Dr. Wallace's article on this subject in the *Fortnightly Review* for March, 1903, I should like to make a few remarks.

As it is at present impossible to fix the exact limits of the visible universe we cannot determine where its centre may lie, and although the sun and solar system *apparently* lie near the centre of the Milky Way, it does not follow that we are really at or near that centre. Indeed, there is evidence to show that we are perceptibly nearer to one side of the Milky Way than to the opposite side. Sir John Herschel was of opinion that the southern portion of the Milky Way near the Southern Cross is nearer to us than the northern part. Professor Newcomb considers that we are probably nearer to the boundary of the visible universe which lies in the direction of Sagittarius and Scorpio, and he thinks that we may possibly be so much nearer this particular region that we may soon be able to detect proper motions among the fainter stars in this direction.

Considering the sun's motion through space as rectilinear, I pointed out ten years ago ("The Visible Universe," p. 197) that at some period back in geological times the sun was probably among the stars of the Milky Way. The solar "apex," or point towards which the sun is moving, is, according to Prof. Kapteyn, in about R.A. 273°·6, North Declination 29° 5, and he thinks that "the most probable value that can at present be adopted" for the sun's velocity is 18·45 kilometres, or 11·46 miles a second. With this velocity, the sun's annual motion would be about 360 millions of miles (or nearly four times the radius of the earth's orbit). Hence the distance traversed in, say, 200,000 years would be 72 billions of miles. As the distance of Sirius from the sun may be taken as 50 billions of miles (parallax 0″·37), the solar motion carried back would place the sun far beyond the distance of Sirius 200,000 years ago. If we go back in geological times, say 5 millions of years, we find the sun at a distance of 1800 billions of miles from its present position in space. This would represent the distance of a star with a parallax of about 0″·01, or about 326 years' journey for light. Removed to this distance the sun would be reduced in brightness to a star of the 10th magnitude. It follows, therefore, that if the sun is moving in a straight line it must have been close to the position of 10th magnitude stars (if of the same size and brightness) some 5 millions of years ago. Going further back in geological time we should find the sun among the stars of the Milky Way. From the apparent connection of bright and faint stars in the Galaxy, Easton thinks that the faint stars of the Milky Way are at a distance which does not greatly exceed that of stars of the 9th and 10th magnitude (*Astrophysical Journal*, March, 1895).

It is of course possible, and indeed probable, that the sun is not moving in a straight line, but in some gigantic orbit round a centre of force. Recent researches seem to show that the centre of the Milky Way probably lies in a direction south of Cassiopeia's Chair, and a little south of the Milky Way (about R.A. 24h.), the sun and solar system lying to the south of the galactic centre, and a little to the

north of the plane of the Milky Way. Now the "apex" of the solar motion lies roughly 90° from this position, and judging from the position of the apex found by Sir William Herschel, Argelander and Airy (about 17h. 30m.), and that indicated by recent researches (about 18h. 30m.), there may perhaps be a shift of the apex towards the centre of the Milky Way, which should be the case if the sun were revolving round a centre. This supposed "shift" may of course be more apparent than real, and may, perhaps, be partly or altogether due to errors of calculation. The various positions, however, assigned to the apex show a tendency at least to shift towards the supposed centre of the Milky Way. However this may be, it seems not improbable that the sun may be revolving round the centre of gravity of the Milky Way, which may also be the centre of gravity of the whole system of stars composing our visible universe. But if this be so, the sun is probably at a great distance from the centre. For its measured velocity is considerable, and in a system of stars, like a globular cluster, those near the boundary would have a greater velocity than those near the centre, the law of force in such a system varying *directly* as the distance from the centre.

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