IS THE UNIVERSE LIMITED?

TO THE EDITORS OF KNOWLEDGE.

SIRS,—In a notice of Dr. A. R. Wallace's recent article by Professor W. H. Pickering, a view of the question of the limits of the universe is taken which I think will strike many of your readers as new, but seems to be borne out to a considerable extent by the Harvard observations on the stars in the constellation of Orion. It is that an infinite number of luminous stars is quite consistent with the limited quantity of light which we receive from the sky, provided that the distance between the stars becomes (on the average) greater the farther we go from the solar system. On the generally accepted scale, the light of a star of the nth magnitude exceeds that of a star of the $n + 1^{th}$ magnitude in the proportion of 2·512 to 1. Now suppose the average distances of the stars in question to be in the ratio of 1·585 ($= \sqrt{2·512}$) to 1, and that owing to the thinning out of the stars the number only increases in the ratio of 1·256 for each degree of magnitude. The total light of the stars of the $n + 1^{th}$ magnitude would then be only one-half of that of the stars of the nth magnitude; and if the same process went on to infinity, the total light of all the stars fainter than the nth magnitude would only be equal to that of stars of the nth magnitude.

Taking the constellation of Orion, the increase in the number of stars for each magnitude has, according to the Harvard observations, come down to 1·4 or 1·3 to 1 before the stars become too faint for measurement. If this proportion continued to infinity the total light would be of very limited amount. The number of stars would indeed be infinite, for the number of the $n + 1^{th}$ magnitude would always exceed that of the nth, but the total light given would diminish rapidly as n increased, and even if

the process went on to infinity could never exceed a very limited amount. It is, however, essential to this theory (assuming that no light is lost in transmission) that the thinning-out should go on to infinity. If it came to a stop anywhere we should arrive at a different result ; and a thinning-out extending to infinity suggests that we are near the centre of the system.

I may add, however, that the constant detection of additional stars by more powerful instruments does not disprove the finiteness (in space) of the visible universe. We may be discovering fainter stars within the same space-limits as those already detected. There are still undiscovered stars (asteroids) within the limits of the solar system, and perhaps our nearest self-luminous neighbour has yet to be detected. Till lately we did not dream of the vicinity of Eros. On this subject (and many others) we must, I think, be content to wait and watch.

　　　　　　　　　　　　　　W. H. S. MONCK.

[The point is not new. It was put forward very clearly by Mr. Charles E. Inglis in KNOWLEDGE, 1900, March, p. 65. It will be remarked that it assumes the proposition Dr. Wallace seeks to establish of the essentially central position of the solar system.—E. WALTER MAUNDER.]