

the instances in which we are able to pick up little fragments of information about some star, we rarely fail to find the result full of wonder and interest.* Let us take the case of one star from this Greenwich catalogue, and see if it will not prove an example of this kind. We will take this one. "No. 2214, 16 Bootis, α ," better known by its name of "Arcturus," as our text; *not chosen at random*, for it was this star that first taught men that the so-called "fixed" stars had movements of their own. Running the eye across the page, we find in the columns headed "Annual Proper Motion," the entries, " $-0^{\circ}.0799$ " and " $+1^{\circ}.977$," and we notice that these are larger than the corresponding entries for other stars. For Arcturus seems to us to move more swiftly across the sky than any other of the brighter stars. True the eye alone could never detect its motion in a single year, or even in several years; but its drift is most perceptible in a telescope, and in the course of generations its change of place becomes evident even to the unaided eye. In eight hundred years it will traverse a portion of the sky equal to the diameter of the full moon; in the two thousand years that have elapsed since the date of the first catalogue of which we know—that of Hipparchus—it has travelled two and a half times that distance.

Already we have drawn upon three countries for our information. The "annual proper motion," the apparent distance in the sky, that is to say, which Arcturus traverses in a year has been deduced by a German astronomer from a comparison of a Greenwich catalogue of the last century with a Russian one of this. For further information we cross the Atlan-

tic, and Dr. Elkin, of the Yale College Observatory, informs us in his annual report of date June 7, 1888, that the "annual parallax" of Arcturus is " $+0^{\circ}.018$."

"Dry figures again," but their meaning is a most marvellous one. They mean that as viewed from the distance of Arcturus, the entire orbit of the earth around the sun would look no larger than the circumference of a halfpenny when looked at from a station ninety miles away. Note that it is not the huge bulk of the earth; no, nor even that of the sun, more than one hundred times greater in diameter, which would appear of this infinitesimal size as seen from Arcturus, but the entire orbit of the earth, 186 millions of miles across. It is this distance, utterly beyond our powers to realize as it is, which would be so dwarfed by the vast interval which divides us from Arcturus as to seem no larger than a halfpenny would appear if set up on the cross of St. Paul's and looked at, say from Leicester.†

It may be asked how we know how large the orbit of the earth would appear to be as seen from Arcturus. We know it because the real change in the position of the earth as it passes in six months from one side of its orbit to another makes the star appear to change its place by a very small amount. The star seems, that is to say, to travel round a tiny orbit

† Dr. Elkin's value for the distance of Arcturus is probably the best we have at present, and as such it has been adopted throughout this paper. But it will be readily understood that in measuring quantities so minute in appearance, but implying distance so vast, the errors may bear a high proportion to the result. Thus the "annual parallax" of Arcturus might possibly be better represented by a farthing or a penny as seen from Leicester, rather than by a halfpenny. But in any case, whatever observations we adopt, Arcturus remains distant, vast, bright and swift, beyond terrestrial comparison, beyond human conception.

*The Gresham Lecturer on Astronomy, the Rev. E. Ledger, gave this spring a course of four lectures on a single star—Sirius.