



LARGE MAGELLANIC CLOUD.

From a photograph taken at Arequipa, Peru, Sept. 18th, 1893.
Exposure, 3 hours.

latitude, however, are not marked on the earth's surface, we must have recourse to the heavens.

Suppose the meridian altitude of a star, looking north to an observer in Auckland, is eighty degrees, now suppose the observer went due south from Auckland till the same star measured seventy-nine degrees when it culminated, or reached its meridian altitude. If the distance between the two places where the observations were made is measured, it would be the length of a degree of latitude, and if this distance is multiplied by three hundred and sixty, the girth of the earth is found. In practice, the measurement of an arc of the meridian, usually embracing several degrees of latitude, is one of infinite precision and exactness, but the principle is the same.

The next step in our survey is to use the distance through the earth between two stations or observatories as a base line to get the distance of the sun from us. The length of this base is so small, compared with the vast distance of the sun, that the triangle is what is termed in geodesy an "ill-conditioned" one, but astronomers have to

make the best of it. It would be beyond the scope of this article to enter into the methods adopted to find the sun's distance. The transits of Venus across the sun's disc, viewed from stations on different sides of the earth, is the method most commonly known, but other and more accurate methods are now used. The mean distance of our luminary is given as 92,780,000 miles. Twice this distance, or 185,560,000 miles, is the length of the diameter of the earth's orbit, and this great distance is the base line for finding the distance of the stars. Stellar distances are, however, so enormous that a triangle, with the length of its known side, 185,560,000 miles, is still a very "ill-conditioned" one indeed, but is the best that the circumstances admit. There are certain minute stars in the direction of Alpha Centauri, but supposed to lie so

immeasurably beyond it, that they are regarded as absolutely fixed, and their places in the heavens as entirely unaffected by our change of position, as the earth circles in its orbit round the sun. The position of Alpha Centauri is accurately measured with reference to some of these minute stars, let us say, to-day. In six months' time we shall have changed our position in space by 185,560,000 miles; again, the position of Alpha Centauri is measured with reference to the same small stars, and it is found that our change of position during that interval has resulted in a change of position of the bright star with reference to the small ones, equal to about three-quarters of a second of arc. With this very small angle and the known length of our base line, Alpha Centauri is found to be at least 25,000,000,000,000 miles from us. It may here be mentioned that photography is now largely used in measuring the relative positions of stars, and is found to be a convenient and accurate method.

The fact is, our sun and his attendant planets are surrounded by practically a vast void, at the least fifty billions of miles across,