

had changed, unless he had noted it with more exactness than any astronomer of his time.

Another unsolved problem among the greatest which present themselves to the astronomer is that of the size of the universe of stars. We know that several thousand of these bodies are visible to the naked eye; moderate telescopes show us millions; our giant telescopes of the present time, when used as cameras to photograph the heavens, show a number past count, perhaps 100 millions. Are all these stars only those few which happen to be near us in a universe extending out without end, or do they form a collection of stars outside of which is empty, infinite space? In other words, has the universe a boundary? Taken in its widest scope this question must always remain unanswered by us mortals, because, even if we should discover a boundary within which all the stars and clusters we ever can know are contained and outside of which is empty space, still we could never prove that this space is empty out to an infinite distance. Far outside of what we call the universe might still exist other universes which we can never see.

It is a great encouragement to the astronomer that, although he cannot yet set any exact boundary to this universe of ours, he is gathering faint indications that it has a boundary, which his successors not many generations hence may locate so that the astronomer shall include creation itself within his mental grasp. It can be shown mathematically that an infinitely extended system of stars would fill the heavens with a blaze of light like that of the noonday sun. As no such effect is produced, it may be concluded that the universe has a boundary. But this does not enable us to locate the boundary, nor to say how many stars may lie outside the farthest stretches of telescopic vision. Yet by

patient research we are slowly throwing light on these points and reaching inferences which, not many years ago, would have seemed forever beyond our powers.

Every one now knows that the Milky Way, that girdle of light which spans the evening sky, is formed of clouds of stars too minute to be seen by the unaided vision. It seems to form the base on which the universe is built and to bind all the stars into a system. It comprises by far the larger number of stars that the telescope has shown to exist. Those we see with the naked eye are almost equally scattered over the sky. But the number which the telescope shows us becomes more and more condensed in the Milky Way as telescope power is increased. The number of new stars brought out with our greatest power is vastly greater in the Milky Way than in the rest of the sky, so that the former contains a great majority of the stars. What is yet more curious, spectroscopic research has shown that a particular kind of stars, those formed of heated gas, are yet more condensed in the central circle of this band; if they were visible to the naked eye, we should see them encircling the heavens as a narrow girdle forming perhaps the base of our whole system of stars. This arrangement of the gaseous or vaporous stars is one of the most singular facts that modern research has brought to light. It seems to show that these particular stars form a system of their own; but how such a thing can be we are still unable to see.

The question of the form and extent of the Milky Way thus becomes the central one of stellar astronomy. Sir William Herschel began by trying to sound its depths; at one time he thought he had succeeded; but before he died he saw that they were unfathomable with his most powerful telescopes. Even to day he would be a bold astronomer who would profess