STAR-DRIFT

WITH reference to the accompanying account of my paper on this subject, recently communicated to the Royal Society, it is to be remarked that the interest, if any, attaching to my results must be founded on the way in which they bear on received theories respecting the distribution of the fixed stars. It is quite evident that according to the views usually accepted, the stars which appear in any part of the heavens must be regarded as situated at very different distances from the eye; the faintest nine or ten times farther from us, at the very least, than the brightest, and the different stars altogether too far apart to exert any influence on each other. Indeed, whatever theory we may hold respecting stellar distribution, regarded generally, we must be prepared to recognise in the stars seen towards any part of the sky, objects which lie at very different distances. And regarding these objects as severally in motion, we must be prepared to find in general the utmost diversity, not only as respects the direction of the apparent motions of the stars, but also as respects the magnitude of these motions. It is only when one has adopted the theory that the stars are grouped according to special laws of aggregation, that one would be led to anticipate that here and there, almost as by accident, so to speak, some indications of their grouping might be discoverable in the characteristics of the stellar proper motions. Although I had become firmly convinced that the stars are not distributed throughout space with any approach to that general uniformity insisted on by many astronomers, I had very little hope that a suggestion I threw out a year ago in the pages of the *Student*, that the stellar proper motions if examined carefully might afford evidence in favour of my views, would be confirmed in any very distinct manner if the method I had pointed out should ever be applied. I knew that a certain community of motion in the constellation Taurus had led Mädler to important, but as I judged incorrect conclusions as to the nature of the stellar motions; but I also knew that that community of motion was one which could only be appreciated by the few who had convinced themselves of what was to be *expected* if the stars were uniformly distributed. I had an impression at that time that Mädler had examined the stellar proper motions over the whole of the northern hemisphere, and that it was the exceptional community of proper motion in Taurus which had led him to form his well-known theory respecting a central sun. It was only when I was reminded that he had in fact examined the stellar proper motions in the neighbourhood of Taurus alone, having been led by independent considerations to regard that neighbourhood as that within which a central sun was to be looked for, that I was encouraged to map down all the recognised proper motions. To my surprise I found that in Gemini, Cancer, and Leo, a community of motion far more striking than that noticed by Mädler in Taurus was to be recognised; and further, that though in other directions, as I had expected, stellar motions belonging to different depths in space were intermixed, it was yet possible to trace out laws of association indicating the existence of drifting star-groups in these directions also.

I lay very little stress on the indications which have led me to name the great double cluster in Perseus as more likely to be an important centre of motion than the Pleiades. But it is worthy of mention that Mädler required a star on the Milky Way as the centre of the galaxy, and Alcyone does *not* lie on the Milky Way; he required his centre to lie ninety degrees from the apex of the solar motion, and Alcyone does *not* lie ninety degrees from the mean of the last determinations of that point. The great cluster in Perseus fulfils both conditions in the most perfect manner.

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A careful examination of the proper motions of all the fixed stars in the catalogues published by Messrs. Main and Stone (Memoirs of the Royal Astronomical Society, vols. xxviii. and xxxiii.) has led Mr. Proctor to the conclusion that in parts of the heavens the stars exhibit a well-marked tendency to drift in a definite direction. "In the catalogues of proper motions, owing to the way in which the stars are arranged, this tendency is masked; but when the proper motions are indicated in maps, by affixing to each star a small arrow whose length and direction indicate the magnitude and direction of the star's proper motion, the star-drift (as the phenomenon may be termed) becomes very evident. It is worthy of notice that Mädler, having been led by certain considerations to examine the neighbourhood of the Pleiades for traces of a community of proper motion, founded on the drift he actually found in Taurus his well-known theory that Alcyone (the *lucida* of the Pleiades) is the common centre around which the sidereal system is moving. But in reality the community of motion in Taurus is only a single instance, and not the most striking that might be pointed out, of a characteristic which may be recognized in many regions of the heavens. In Gemini and Cancer there is a much more striking drift towards the south-east, the drift in Taurus being towards the south-west. In the constellation Leo there is also a well-marked drift, in this case towards Cancer.

"These particular instances of star-drift are not the less remarkable, that the stars are drifting almost exactly in the direction due to the proper motion which has been assigned to the sun, because the recent researches of the Astronomer Royal have abundantly proved that the apparent proper motions of the stars are not to be recognised as principally due to the sun's motion. Mr. Stone has shown even that we must assign to the stars a larger proper motion, on the average, than that which the sun possesses. Looking, therefore, on the stars as severally in motion, with velocities exceeding the sun's on the average, it cannot but be looked upon as highly significant that in any large region of the heavens there should be a community of motion such as I have described. We seem compelled to look upon the stars which exhibit such community of motion as forming a distinct system, the members of which are associated indeed with the galactic system, but are much more intimately related to each other. In other parts of the heavens, however, there are instances of a star-drift opposed to the direction due to the solar motion. A remarkable instance may be recognised among the seven bright stars of Ursa Major. Of these, the stars β, γ, δ, ϵ, and ζ are all drifting in the same direction, and almost exactly at the same rate towards the "apex of the solar motion," that is, the point *from* which all the motions due to the sun's translation in space should be directed. If these five stars, indeed, form a system (and I can see no other reasonable explanation of so singular a community of motion), the mind is lost in contemplating the immensity of the periods which the revolutions of the components of the system must occupy. Mädler had already assigned to the revolution of Alcor around Mizar (ζ Ursæ) a period of more than 7000 years. But if these stars, which appear so close to the naked eye, have a period of such length, what must be the cyclic periods of stars which cover a range of several degrees upon the heavens? In like manner the stars α, β, and γ Arietis appear to form a single system, though the motion of α is not absolutely coincident either in magnitude or direction with that of β and γ, which are moving on absolutely parallel lines with equal velocity. There are many other interesting cases of the same kind." The author hopes soon to be able to lay before the Royal Society a pair of maps in which all the well-recognised proper motions in both hemispheres are exhibited on the stereographic projection. In the same maps also the effects due to the solar motion are exhibited by means of great circles through the apex of the solar motion, and small circles or parallels having that apex for a pole. The star-drift described by Mr. Proctor serves to explain several phenomena which had hitherto been thought very perplexing. In the first place, it accounts for the small effect which the correction due to the solar motion has been found to have in diminishing the sums of the squares of the stellar proper motions. Again, it explains the fact that many double stars which have a common proper motion, appear to have no motion of revolution around each other; for clearly two members of a drifting system might appear to form a close double, and yet be in reality far apart and travelling, not around each other, but around the centre of gravity of the much larger system they form part of. While mapping the proper motions of the stars, Mr. Proctor has been led to notice that the rich cluster around χ Persei falls almost exactly on the intersection of the Milky Way with the great circle which may be termed the equator of the solar motion; that is, the great circle having the apex of the sun's motion as a pole. This circumstance points to that remarkable cluster, rather than to the Pleiades, as the centre of the sidereal system, if indeed that system has a centre cognisable by us. When we remember that for every fixed star in the Pleiades there are hundreds in the great cluster in Perseus, the latter will seem the worthier region to be he centre of motion. The author is disposed, however, to regard the cluster in Perseus as the centre of a portion of the sidereal system, rather than as the common centre of the Galaxy.