the concatenation of causes if there were not one primordial immovable motor."*

The manifold translatory changes of the stars, not those produced by the parallaxes at which they are seen from the changing position of the spectator, but the true changes constantly going on in the regions of space, afford us incontrovertible evidence of the *dominion of the laws of attraction* in the remotest regions of space, beyond the limits of our solar system. The existence of these laws is revealed to us by many phenomena, as, for instance, by the motion of double stars, and by the amount of retarded or accelerated motion in different parts of their elliptic orbits. Human inquiry need no longer pursue this subject in the domain of vague conjecture, or amid the undefined analogies of the ideal world; for even here the progress made in the method of astronomical observations and calculations has enabled astronomy to take up its position on a firm basis. It is not only the discovery of the astounding numbers of double and multiple stars revolving round a center of gravity lying *without* their system (2800 such systems having been discovered up to 1837), but rather the extension of our knowledge regarding the fundamental forces of the whole material world, and the proofs we have obtained of the universal empire of the laws of attraction, that must be ranked among the most brilliant discoveries of the age. The periods of revolution of colored stars present the greatest differences; thus, in some instances, the period extends to 43 years, as in η of Corona, and in others to several thousands, as in 66 of Cetus, 38 of Gemini, and 100 of Pisces. Since Herschel's measurements in 1782, the satellite of the nearest star in the triple system of ζ of Cancer has completed more than one entire revolution. By a skillful combination of the altered distances and angles of position,† the elements of these orbits may be found, conclusions drawn regarding the absolute distance of the double stars from the Earth, and comparisons made between their mass and that of the Sun. Whether, however, here and in our solar system, quantity of matter is the only standard of the amount of attractive force, or whether *specific* forces of attraction proportionate to the mass may not at the same time come into operation, as Bessel was the first to conjecture, are questions

* Aristot., *de Cœlo*, iii., 2, p. 301, Bekker; *Phys.*, viii., 5, p. 256.

† Savary, in the *Connaissance des Tems*, 1830, p. 56 and 163. Encke, *Berl. Jahrb.*, 1832, s. 253, &c. Arago, in the *Annuaire*, 1834, p. 260, 295. John Herschel, in the *Memoirs of the Astronom. Soc.*, vol. v., p. 171.