

be found that with regard to some of these stars, and γ Virginis in particular, the conformity of the observations with the laws of elliptical motion amounts to a degree of exactness which must give astronomers a strong conviction of the truth of the law. For since Sir W. Herschel's first measures in 1781, the arc described by one star about the other is above 305 degrees; and during this period the angular annual motion has been very various, passing through all gradations from about 20 minutes to 80 degrees. Yet in the whole of this change, the two curves constructed, the one from the observations, the other from the elliptical elements, for the purpose of comparison, having a total ordinate of 305 parts, do not, in any part of their course, deviate from each other so much as *two* such parts.]

The verification of Newton's discoveries was sufficient employment for the last century; the first step in the extension of them belongs to this century. We cannot at present foresee the magnitude of this task, but every one must feel that the law of gravitation, before verified in all the particles of our own system, and now probably extended to the all but infinite distance of the fixed stars, presses upon our minds with a strong claim to be accepted as a universal law of the whole material creation.

Thus, in this and the preceding chapter, I have given a brief sketch of the history of the verification and extension of Newton's great discovery. By the mass of labor and of skill which this head of our subject includes, we may judge of the magnitude of the advance in our knowledge which that discovery made. A wonderful amount of talent and industry have been requisite for this purpose; but with these, external means have co-operated. Wealth, authority, mechanical skill, the division of labor, the power of associations and of governments, have been largely and worthily applied in bringing astronomy to its present high and flourishing condition. We must consider briefly what has thus been done.