

structed. Yet with these unwieldy and ungainly telescopes, nearly always defining badly, wonders were accomplished by the painstaking and indomitable observers of the time.

In 1658, Huyghens, using a telescope twenty-three feet long, and two and one-third inches in clear aperture, armed with a power of 100, discovered the complex character of the Saturnian system, which had resisted all of Galilei's efforts, as well as his own with a shorter instrument, though he had discovered Titan, Saturn's largest moon, and fixed correctly its period of revolution. One of the regrets of scientific men is that Galilei died in ignorance of the true construction of Saturn's ring-system. Many a weary night he expended in trying to arrive at a satisfactory explanation of the most extraordinary and unaccountable phenomena presented from year to year by that planet. Its behavior was to him so erratic, that, annoyed beyond measure, he finally desisted from observing it. Would that before he died the old hero in the cause of Science could have possessed a telescope powerful enough to solve the mystery!

In 1673, Ball, with a telescope thirty-eight feet long, detected, for the first time, the principal division in Saturn's rings. Ten years later, Cassini, with an instrument twenty feet long, and an object-glass two and one-half inches in diameter, re-discovered the division, which was thenceforth named after him, rather than after Ball, who had taken no pains to make widely known his discovery, which, in the meantime had been forgotten. Though we have no record, there is little doubt that the lamented Horrocks and Crabtree, in England, in 1639, with glasses no better than these, watched, with exultant emotions, the first transit of Venus ever seen by human eyes. In 1722, Bradley, with a telescope 22 $\frac{3}{4}$ feet long, succeeded in measuring the diameter of the same planet.

In all ages, astronomers have been

remarkable for assiduous application, and for perseverance even under the most discouraging circumstances. The astronomer of to-day can form but an inadequate conception of the difficulties with which the astronomers of the Seventeenth and Eighteenth Centuries had to struggle. When, at the commencement of the Nineteenth Century, it became possible to construct good refracting telescopes of larger aperture, and giving sharper definition, the industry of these observers had been such that, on the authority of Grant, we are assured they had discovered everything that could have been discovered with the optical means at their command.

Toward the middle of the Eighteenth Century, eminent men having, as they thought, decisively proved that refracting telescopes could not be brought to the state of perfection necessary for satisfactory astronomical work, turned their attention to the development of the reflecting telescope, which was constructed upon a different principle, and did not require that the light-rays should pass through a glass medium before being brought to a focus for examination in the eye-piece. This development, especially in the hands of the patient Herschel, was rapid, but just at the moment the refractor was in danger of total eclipse, Dollond, experimenting along lines not unknown to, but insufficiently followed up many years before by, Hall, found that by making the great lens, or the object-glass at the end of the tube, of two or three pieces of glass of different densities, and, therefore, of different refractive powers, the color aberration of the refracting telescope could be very perfectly corrected. Dollond's invention was of immense value, but, unfortunately for him and it, it was not possible, immediately at least, to manufacture of flint-glass, the color-correcting medium, discs sufficiently large to use with the lenses of crown-glass; the latter could be made of six, seven, and even of eight inches in