

also, from a letter of his to Benedetto Castelli (30th of December, 1610), that he believed, notwithstanding the low magnifying power of his telescope, that he could recognize changes in the illumined disk of Mars. The discovery of the moon-like or crescent shape of Venus was the triumph of the Copernican system. The founder of that system could scarcely fail to recognize the necessity of the existence of these phases; and we find that he discusses circumstantially, in the tenth chapter of his first book, the doubts which the more modern adherents of the Platonic opinions advance against the Ptolemaic system on account of these phases. But, in the development of his own system, he does not speak expressly of the phases of Venus, as is stated by Thomas Smith in his *Optics*.

The enlargement of cosmical knowledge, whose description can not, unhappily, be wholly separated from unpleasant dissensions regarding the right of priority to discoveries, excited, like all that refers to physical astronomy, more general attention, from the fact that several great discoveries in the heavens had aroused the attention of the public mass at the respective periods of thirty-six, eight, and four years prior to the invention of the telescope in 1608, viz., the sudden apparition and disappearance of three new stars, one in Cassiopeia in 1572, another in the constellation of the Swan in 1600, and the third in the foot of Ophiuchus in 1604. All these stars were brighter than those of the first magnitude, and the one observed by Kepler in the Swan continued to shine in the heavens for twenty-one years, throughout the whole period of Galileo's discoveries. Three centuries and a half have now nearly passed since then, but no new star of the first or second magnitude has appeared; for the remarkable event witnessed by Sir John Herschel in the southern hemisphere (in 1837)* was a great increase in the intensity of the light of a long-known star of the second magnitude (η Argo), which had not until then been recognized as variable. The writings of Kepler, and our own experience of the effect produced by the appearance of comets visible to the naked eye, will teach us to understand how powerfully the appearance of new stars, between the years 1572 and 1604, must have arrested attention, increased the general interest in astronomical discoveries, and excited the minds of men to the combination of imaginative conjectures. Thus, too, terrestrial natural events, as earthquakes in regions where they have been but seldom experienced; the eruption of volcanoes that had long remained inactive; the

* Compare *Cosmos*, vol. i., p. 153 and 353.