ASTRONOMY AND MILTON.

The Astronomy of Milton's "Paradise Lost." By Thomas N. Orchard, M.D. 8vo, pp. 388. (London: Longmans, Green, and Co., 1896.)

THIS work amounts in fact to a sketch of the history of astronomical discovery under the heads of the different departments of that science to which allusions are made in the great epic of the sublimest of our poets. The author justly remarks that the choicest passages in "Paradise Lost" are associated with these allusions; his main object has been their exposition and illustration, and his enthusiasm has led him to include a wealth of matter in carrying this out, which his readers will not regret. Milton lived in a critical period of astronomical progress. The discoveries of Galileo and Kepler had shown the great probability of the truth of the Copernican system; but Newton had not yet placed that system upon an irrefragable basis. Hence, "in describing the natural phenomena witnessed by our first parents, he adheres to the doctrine of the Ptolemaic system," whilst it is evident from many passages, particularly from the discourse between Adam and the angel in the eighth book, that he saw and appreciated the simplicity and beauty of the Copernican theory, on which he had doubtless conversed with Galileo, the "Tuscan artist," when on his travels in his younger days. All will remember how he represents Raphael as speaking with scarcely-veiled sarcasm of the sphere being supposed to be girded with "Centric and Eccentric scribbled o'er, Cycle and Epicycle, orb in orb," and Adam's difficulty at conceiving "how nature, wise and frugal, could commit such disproportions." Mr. Masson has, we need hardly say, written well on the cosmogony of "Paradise Lost" in the introduction to his edition of Milton; but Dr. Orchard has treated the subject with an abundance of illustration which fully justifies his hope that his contribution to Miltonic literature is both interesting and instructive. A chapter is devoted to the poet's visit to Galileo, and the allusions thereto; it is somewhat remarkable that Milton nowhere mentions the fact that the astronomer was then blind, an affliction which afterwards befell himself. Satan's shield is compared to the glass with which the moon was viewed from the top of Fesolé, a suburb of Florence, or in Valdarno, meaning the valley of the Arno in which that city was situated. Less pertinent to his subject is the sketch of the discoveries of Herschel and others in the sidereal heavens or the region of the fixed stars, of which scarcely anything was known until long after the time of Milton, the date of W. Herschel's birth being exactly a century after the poet's visit to Florence. Dr. Orchard does not seem to have disabused himself of the so-called island theory of the nebulæ, which, it is now clear, have some relation to our own galactic system; but, on the whole, his survey of the history of sidereal astronomy is accurate. There are many allusions in "Paradise Lost" to the starry host "spangling the hemisphere"; and one fine passage speaks of their motions "regular then most when most irregular they seem," which, however, may refer chiefly to the planets, and only by analogy to other systems conceived as probably existing, but not then known. Three constellations (besides the cluster of the Pleiades) are mentioned by name: Taurus, Ophiuchus, and Andromeda, the "fleecy star" near the last being generally supposed to be Aries or its principal star, though this is not certain. Much more frequent allusion is made in the poem to the sun than to any of the other orbs of the firmament, and that body is described "in a manner worthy of his unrivalled splendour and of his supreme importance in the system which he upholds and governs." Probably few passages in any poem are more familiar to all than Satan's address to the great luminary, whose beams the spirit of evil is appropriately represented as hating. Venus is alluded to under the name Hesperus, and as the evening star; and the Galaxy or Milky Way is described as "a broad and ample road, whose dust is gold and pavement stars." As to comets, they are twice introduced, oddly enough in one place as a simile to Satan, and in another to "the brandished sword of God." In the former of these places Milton makes a remarkable mistake by speaking of a comet "that fires the length of Ophiuchus huge in th' arctic sky." No part of Ophiuchus is thus situated; does he mean Draco? Dr. Orchard himself makes a mistake in p. 297, calling 1456 "the year in which the Turks obtained possession of Constantinople." The last chapter, on Milton's imaginative and descriptive astronomy, is, as might be expected, more full of passages from the great poem than any other, and appropriately closes a work which deserves, and will probably attain, a wide circulation.

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OUR BOOK SHELF.

Cholera in Indian Cantonments, and how to deal with it. By E. H. Hankin, M.A. Pp. iv + 103. (Allahabad: *Pioneer* Press. Cambridge: Deighton, Bell, and Co., 1895.)

THE knowledge of the cholera microbe, gained during the past few years, is applied in this little volume in formulating directions for the prevention of the disease. The author has had exceptional opportunities of studying cholera outbreaks in India; and his experience in investigating sources of infection, renders the practical precautions he describes as necessary to prevent the spread of the disease in Cantonments, of great value to Cantonment magistrates, medical officers, and others interested in the question. Before dealing with the practical hints for the prevention of cholera, Mr. Hankin gives a brief account of the properties of the cholera microbe, which may be summarised as follows: (1) The cholera microbe when outside the human body, so far as is known, only lives and reproduces in water; (2) it is so small that it cannot be removed by filtration through ordinary domestic filters; (3) it is easily and rapidly destroyed by boiling; (4) it is rapidly destroyed by drying; (5) it is readily killed by acids; (6) it varies in virulence; (7) laboratory experiments show that its growth is favoured by the presence of traces of common salt and of nitrates in its culture fluids.

In a chapter on cholera epidemics, irregular and otherwise, it is shown that infection is caused by swallowing the microbe either in food or water; hence the precautions laid down are mainly concerned with the means for preventing the access of the microbe to the food and water supply, and with easy methods of disinfection. The instructions given are such as can readily be carried out, and though they are not so elaborate as the regula-