

Reviews.

THE ASTRONOMY OF DANTE.

An interesting literary contribution to the sixcentenary celebrations in honour of Dante is contained in the Italian periodical *Conferenze e Prolusioni* for September 16 last, in which Professor Pio Emanuelli publishes a lecture, recently delivered by him at Rome, dealing with the many references to astronomy which are to be found scattered throughout the works of the poet. At the outset the professor warns his readers to exercise judgment in the interpretation of Dante's astronomical allusions, and he remarks that the poet himself would have had little hesitation in committing certain of his modern commentators to the *Inferno*, had he been able to foresee the nature of their criticisms. Some, for instance, have pretended to find in the *Divina Commedia* a kind of *Almagest*, whereas Prof. Emanuelli wisely points out that, although displaying perhaps a unique alliance between the poetic and the scientific spirit, Dante always made his astronomy subservient to his poetry, and on certain occasions (which he duly cites) even "accommodates" his facts to his fantasy.

The subject of Dante's astronomy already boasts an extensive literature, which includes the names of Schiaparelli, Denza, Zanotti-Bianco, and Millosevich on the Italian side, and, among "foreign" writers, Dreyer, Gardner, and Mrs. Evershed. The work of the last-named, which we had the pleasure of reviewing in these pages some time ago,* Prof. Emanuelli pronounces to be by far the most organically complete treatise on the subject known to him, and it is not a little gratifying to find him regretting the absence of an Italian version of the book.

A large proportion of the professor's lecture of necessity appeals more to the Dantophilist than to the astronomer, but the latter cannot fail to be fascinated with the description of the poet's cosmological views in general. The universe of Dante was based on the writings of Aristotle and Ptolemy, and although to-day his imagery often appears to us to be artificial and forced, it possesses nevertheless a deep significance as showing the gradual unfolding of the human intellect in its slow endeavour throughout the centuries to unravel the mysteries of the stars. Dante, however, was a close observer of nature in all her aspects, and devoted far more attention to the actual appearance of the heavens, as they presented themselves to his eyes, than do the imaginative writers of our own time. Only in the case of comets, as Prof. Emanuelli points out, does the poet observe a strange silence, mentioning them but once in the *Paradiso*. Yet Dante must have seen several during his lifetime, one of them, viz. that which appeared in the autumn of 1301, being none other than the comet afterwards known as Halley's. With regard to the Milky Way, Prof. Emanuelli reminds us that Dante held views far in advance of his age. Thus, in a passage in the *Convito*, the poet affirms that the light of the Galaxy is due to the united radiance of a multitude of small stars, whereas his contemporaries considered the phenomenon to have a meteoric origin. Although based on a mistaken reading of Aristotle, we must agree with the professor that this sagacious idea of the poet shows him to have had a wonderful insight into the causes of things, for it was not until three centuries afterwards that the invention of the telescope permitted his views to be successfully put to the test.

One point more in Prof. Emanuelli's interesting lecture calls for notice. It is often suggested that Dante worked out the astronomical data for himself when referring to the planetary configurations, &c., which occurred on his imaginary journey, for he is always careful to observe a natural chronological sequence in his description of celestial phenomena. But Prof. Emanuelli brings evidence to prove that the poet, like ordinary

* See Journal, Vol. XXV., p. 103, for review of *Dante, and the Early Astronomers*, by M. A. Orr (Mrs. John Evershed). 8vo. London: Gall & Inglis, 1914.

mortals, consulted an almanac for the purpose, and, from a curious slip regarding the position assigned to Venus in the first canto of the *Purgatorio*, he is even able to point to the particular almanac used, viz. that compiled by the Jewish chronologist known as Profazio!

All who know their Dante, however, must acknowledge that the divine poet was an enthusiastic admirer of the heavens, and those who read Italian will be grateful to Prof. Emanuelli for once again bringing this fact so pleasantly to their notice. It speaks eloquently for Dante's love of astronomy that he contrives to end each of the three parts forming his great work with the word *stelle*.—W. A. P.

Natural Sines, to every Second of Arc and to Eight Places of Decimals. By Mrs. E. Gifford. Manchester: Abel Heywood and Son, 1914. Obtainable only from the Author, Chard, Somerset. Price £1.

The modern introduction of the calculating machine should have given as much stimulus to the art of computing as did the appearance of Napier's Canon of Logarithms over 300 years ago. If it has failed to do this it is largely because our tables are now nearly all logarithmic, and not adapted to use with machines. Mrs. Gifford has come to the rescue and remedied this defect by supplying a table of natural sines which will serve all the requirements of the average computer. Her choice of 8 decimals and an interval of 1" could not have been wiser, for none except those who prepare tables for special purposes would ever require anything more elaborate.

The author has given a description of the manner of preparation of the table in the *Napier Tercentenary Memorial Volume*, published by the Royal Society of Edinburgh in 1915. It has been compiled from the *Opus Palatinum* of Rheticus, published in 1596, which tabulates the natural trigonometrical functions to 10 decimals at intervals of 10". The first task was to eliminate errors from Rheticus by careful and systematic differencing. The sines for single seconds were interpolated to 10 places, and finally reduced to 8 places for publication. The finished table was then compared with Callet's table of natural sines, which gives the sine of every 324th second (1,000 sines to the quadrant) to 15 places. Thus we are entitled to place every confidence in the work. A few printers' errors have crept in, but in the copy before us these have all been corrected by hand.

We could have wished for one or two modifications in the manner of arranging the table. Firstly it would have been more convenient if successive sines had been placed in the same column instead of in the same row, although this would have entailed the division of the sines into groups of 3 and 5, instead of, as at present, into groups of 4 and 4. If this had been done it would have been possible to arrange the table as one of sines and cosines to 45°, with arguments at the right-hand side for angles greater than 45°, as is done in most tables. At present a cosine must be found as the sine of its complementary angle. The proportional parts, which are based on the 10-place difference for every 5th minute, must be used cautiously, *i.e.*, it is necessary, if an occasional error of 1 in the 8th place is to be avoided, to apply the difference to the nearest tabular entry.

The figures are not too small, and, although the paper is perhaps a little thin, the binding is good, and the tables will last a lifetime. The compilation has evidently been a labour of love, and users of machines cannot be too grateful to Mrs. Gifford for her splendid effort. We can strongly recommend the work to all those who have progressed beyond the logarithmic stage.—L. J. C.

Natural Tangents, to every Second of Arc and Eight Places of Decimals, from 0° to 15°. By Mrs. E. Gifford. Manchester: Abel Heywood and Son, 1920. Price 8s.

This is a companion volume to the above, and has been prepared, printed, and bound in the same way. We regret, however, that the decimals of the proportional parts are not given; this does not affect an

interpolation to tenths of a second, but has to be considered in working to hundredths. We understand that a similar volume of natural tangents from 0° to 45° is now in the press. Pending publication of the tangents for the last half of the quadrant, the relation $\tan(90^\circ - A) = \frac{1}{\tan A}$ will enable the present tables to meet all cases. We wish Mrs. Gifford health and strength so that she may complete her noble and self-imposed task.—L. J. C.

Astronomical Photography for Amateurs. A complete Guide for Photographing the Sun, Moon, Stars, Comets, Nebulæ, &c. Lenses, Telescopes, and other Apparatus required. Instructions for using them. By H. H. Waters. Gall and Inglis, 20, Bernard Terrace, Edinburgh, and 31, Henrietta Street, Strand, London, W.C. 2. Price 6s. net.

This is a little book which should appeal to a large number of amateurs, who, possessing only modest photographic apparatus, are yet anxious to turn it to account in connection with their astronomical studies, and is written primarily for those possessing no clock-driven instrument. The book opens with a chapter on the general conditions necessary for successful photographic work; then the reader is introduced to apparatus and methods of working, which are described in great detail. A chapter follows on the adjustment of a portable equatorial stand, which, while not strictly in keeping with the title of the book, is interesting and instructive.

Guidance is given for different branches of celestial photography, followed by a short chapter on developing, printing, and enlarging.

The work is not without its defects, and we should like to have seen more space devoted to the question of plates and developers. The author states he has carefully tested many of the well-known makes, and arrives at the conclusion that very few brands are suitable for "critical astronomical work." He seems hazy about the advantages of isochromatic plates; and to those who are thinking of taking up astro-photography, these are questions they want enlightenment upon. It is true a fairly rapid and vigorous developer is recommended for stellar work, but we believe this is contrary to professional custom. A serious omission occurs in the chapter on Solar photography. No mention is made of the use of a focal-plane shutter, without which no successful work can be done.

The reproductions of photographs are very poor, and convey scarcely any idea of the beauty of celestial photography even when undertaken with small cameras.

Notes.

COMET NOTES.—I have been glad to hear from Mr. Basil Brown that he has spent a good many hours in sweeping for comets. This should be one of the main objects of the sectional workers, especially when no known comets are within reach. It is well to reiterate that any sketches sent indicating the positions either of known comets or suspected objects should contain as many stars as possible, and should indicate the scale and the positions of the points N. E. S. W., which may readily be obtained by remembering that the diurnal motion is towards W.

Perhaps I may be allowed to state how greatly I have appreciated the numerous messages of sympathy I have