

Narni to the Tiber. Bertarelli's "Guida itineraria del Touring Club italiano," route 180, puts the true aspect of this dissected country before the geographic tourist. Such tourists will receive much encouragement from the broad views of western lands provided in the book before us. Perhaps in another volume the author will show how intensive studies of equal value may be carried on by easy deviations from frequented ways. The piazza of Todi, 1350 feet above the sea, Foix on the Ariège, guarding one of the few passes into Spain, or Radstadt, tinkling with cattle-bells, on the high pastures of the Tauern, may serve as epitomes of their regions and of the reaction of environment on man. But Dr. Newbigin certainly does not need suggestions.

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History of Astronomy.

Histoire de l'Astronomie. Par E. Doublet. (Encyclopédie scientifique.) Pp. 572. (Paris: G. Doin, 1922.) 17 francs.

IN his first chapter the author passes in review the principal works on the history of astronomy, beginning with Weidler's book and ending with the great work by Duhem on the cosmical systems. Of the valuable books of Grant and R. Wolf, only the titles are given, and several others are omitted altogether. Of monographs, only Schiaparelli's first two papers are mentioned. This is natural enough, since there is plenty of evidence that the author is quite unacquainted with the rich literature of memoirs and short papers on the history of astronomy which has appeared within the last fifty years. Whenever a fact is not mentioned by Delambre, Duhem, etc., it will be looked for in vain in M. Doublet's pages, and whenever fresh light has been thrown on any subject since they wrote, he is not aware of it. Take, for example, the paragraph on Hipparchus. We are told that his diopter was in the Middle Ages called a Jacob's staff; in reality the former had a cursor with a round hole in it, and was used only for measuring small angles such as the diameters of sun or moon, while the latter was shaped like a cross, with the shorter arm movable (on p. 152 the invention of the baculus is correctly attributed to Levi ben Gerson of Avignon, as Duhem had also done). The star of Hipparchus is compared to the new star of 1572, whereas there can be no doubt that it was nothing but the comet of 134 B.C. The star-catalogue of Hipparchus is said to contain 1025 stars and to have been handed down to us by Ptolemy, but it has been shown by Boll that the catalogue probably contained only about 850 stars, while it is now universally recognised that Ptolemy's catalogue is not a mere reproduction of that of Hipparchus. Next it is stated that Hip-

parchus put the solar parallax equal to 3'; it was Ptolemy who did that, whereas Hipparchus said that it was at most a minute and a half. On the same page we read that Hipparchus determined the principal lunar inequalities with admirable precision. Hipparchus knew only one inequality, the equation of the centre; but that is, perhaps, a slip, as it is elsewhere (p. 110) mentioned that Ptolemy discovered the evection.

The most valuable part of Duhem's work is his account of Latin astronomy in the later Middle Ages, as he was able to make use of many manuscript sources. M. Doublet has done right in quoting him largely; but here, as everywhere else, the consequences of never referring to the original sources are evident. Duhem gives a very unsatisfactory account of the planetary system of Al Betrugi, which was very much discussed in the thirteenth century both at Paris and at Oxford. The account of it by M. Doublet similarly misses the most important part of the system. In the same way, the account of King Alfonso and his Tables reproduces all the old misstatements which have been refuted long ago. The tables were *not* published at the time of the King's accession, but some twenty years later, and *no* change was made in them as regards precession; they were *not* prepared by a "numerous commission," for it would have been necessary to raise the dead, since the alleged members of that Royal Commission lived long before King Alfonso's time. The "Libros del Saber" were never translated into Latin, and were quite unknown until they were at last printed some sixty years ago, and the last edition of the tables was not printed then, but in 1641.

The author's account of the progress of astronomy from the end of the Middle Ages to the time of Newton does not differ much in extent or quality from the earlier chapters. We have only space to direct attention to a misunderstanding on p. 255, with regard to Kepler's work on Mars. What produced errors of 8' was not the use of the Tyconic system (for that, of course, made no difference whatever, being merely the Copernican system with the origin of co-ordinates transferred to the earth), but the use of an excentric circle with "bisected excentricity," after the manner of Ptolemy.

Having found the first two-thirds of the book rather disappointing, we are glad to say that the chapters on French astronomers in the eighteenth and first half of the nineteenth century are very interesting and pleasant to read. They do not go into details as to the work of these astronomers, any more than do the earlier chapters, but they tell a good deal about the Cassinis, the Maraldis, etc., down to Arago and Leverrier, which will be new to most readers.

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