a conic through A, B, C. Since the circular points pass into each other, the line ∞ becomes the circle $A\,B\,C$. Thus the behavior of a line with respect to this circle determines the nature of the conic found by transforming the line. This is, in effect, Dr. Schwatt's starting point. He then discusses in detail the form of the conic for special lines connected with the triangle. As a specimen hyperbola, the isogonal conjugate is taken of that diameter of the circle $A\,B\,C$ which passes through the point called by different writers the symmedian point, Grebe's point, and Lemoine's point. It is enough here, to characterize this point K, to say that $A\,B\,C\,K$ is a "Polviereck" or conjugate tetrad of the circle. As a specimen ellipse, the isogonal conjugate of the polar of K as to the circle is considered in detail. This ellipse also has aliases, being called here Steiner's ellipse, but being also called the maximum circum-ellipse.

The properties of Simson's line are also considered, and many details are given as to various points, lines and triangles connected with the given triangle. The method employed is for the most part that of Euclid. The nomenclature used differs a good deal from that of Casey. In one instance the same name is applied differently; Kiepert's hyperbola is with Casey and others a definite hyperbola, but with Dr. Schwatt it is any hyperbola through $A\,B\,C$.

The question of giving references, when dealing with matter both fairly recent and elementary, is an open one. In this case none are given; but it seems a pity not to give a short list of works on the subject, and a critical, or expurgatorial, list would be useful.

F. MORLEY.

Annuaire pour l'An 1897 publié par le Bureau des Longitudes. Paris, Gauthier-Villars et Fils.

The *Annuaire* for 1897, which has just appeared, contains 738 pages of tables and descriptive matter and 175 pages of appendices. The astronomical data, which are as usual, very complete, include the comets discovered up to the end of 1895 and the asteroids up to 1896, September 7th; the latter were then 431 in number. A new double star orbit, that of Σ 1879, is introduced, and some new determinations of previously known orbits are added. There are, however, some further changes which might have been made. On p. 159 the value $8''.86$ is used for the solar parallax in preference to the now generally accepted value of $8''.80$ which is merely mentioned in a foot-note. In the same place the mean distance of the earth from the sun is given to *eight*

significant figures. This is surely unnecessary, seeing that the solar parallax, on which its determination directly depends, is scarcely known to *three* significant figures; the result is useless to astronomers and misleading to others. Again the definition of the mean equatorial horizontal lunar parallax (p. 187) is inaccurate. The value given is not that which corresponds to the mean distance of the moon from the earth, but that which corresponds to the mean value of the ratio of the angle (or sine of the angle) under which the earth is seen from the moon, that is, the value of the constant term in the expression for the *parallax* when the latter (and not the *distance*) is expressed as a sum of periodic terms.

The articles contained in the appendices are chiefly astronomical in character. The first three by Tisserand, probably almost the last of his scientific contributions, refer to the proper motion of the solar system and to accounts of the fourth session of the international photographic chart committee and of the progress made by the commission on fundamental stars. The first of these is mainly historical, containing a brief resumé of the methods used to obtain the velocity and apex of the sun's way with the resulting values. In appendix E, "Les Époques dans l'Histoire astronomique des planètes", M. Janssen discusses the well-worn question of the habitability of the planets. In the following article the same writer reports on the progress made in the observatory on Mont Blanc; as those who attempted to walk above the snow-line in Switzerland last summer may imagine, little was done owing to the unusually bad weather.

Perhaps the most interesting article is one by M. H. Poincaré on the new rays of various kinds which have been lately discovered. It is not often that we have the privilege of reading a perfectly clear and at the same time elementary exposition of the details of a popular scientific discovery from so high an authority on mathematics and physics. M. Poincaré first explains the different kinds of radiation which are recognized as being due to transverse vibrations of the ether. He adds that nothing proves the non-existence of longitudinal vibrations, in spite of Maxwell's equations. If experience teaches us that the latter kind may exist, "il suffirait de changer les équations d'un trait de plume." Sections are then devoted to the practical and theoretical details of the cathode and Röntgen rays. With regard to the theories brought forward to explain the former —the emission theory of charged particles of matter (which is characterized as English) and the undulatory theory

("German")—M. Poincaré preserves a judicial impartiality, simply giving the arguments pro and con. As to the Röntgen rays, the resemblance which they bear in many respects to the Becquerel rays tempts the author to conclude that they are of the same nature as light rays and that they owe their singular properties to their very short length of wave. It may be mentioned that at a recent session of the Cambridge Philosophical Society (see Nature, 1896, December 17), Professor Stokes has made an attempt to reconcile the conflicting theories of the kathode rays, adopting the emission theory in the main to account for their properties, while he believes that the X-rays are either of very short wave length or are non-periodic in character—somewhat in the same way as the "hedge-fire" of a regiment of soldiers.

The other appendices contain obituary notices of Fizeau and Tisserand and, what is rare in French books, thoroughly good indices.

In spite of the general completeness of the volume, some subjects are entirely omitted. No meteorological statistics are given; a few charts or tables of average temperature, rainfall, prevailing winds and currents, etc., might not unreasonably have been expected. Again, on p. 77 we miss the maps which give at a glance the regions over which the solar eclipses for 1897 are visible, while a detail like a chart of stellar spectra is inserted on p. 353. Political considerations will doubtless account for the inclusion of the Sahara amongst the French possessions in one place and its exclusion in another. But we should like to know what "motifs d'ordre purement administratif" induce the Railway authorities in France to keep the clocks *inside* the stations some minutes slow while the clocks *outside* mark the correct Paris mean time!

ERNEST W. BROWN.