SHORTER NOTICES.

An Introduction to the Modern Theory of Equations. FLORIAN CAJORI. New York, The Macmillan Company, 1904. ix + 239 pp.

A VERY clear elementary account of the ordinary theory of equations, including Gauss's 1849 proof that every algebraic equation has a root, is given in pages 1–103. Prior to the algebraic solution of the general cubic C and quartic Q, criteria of the nature of their roots are derived from the equations whose roots are the squares of the differences of every two of the roots of C and Q, respectively.

The usual elementary chapter on substitutions is followed by the elements of substitution groups, including a list of all the substitution groups of degree $\leqq 5$. It would have been instructive to the student to see the elementary proof of this enumeration for degrees $\leqq 4$.

At the end of § 110, the author omits the condition for a series of composition that P_{i+1} is a maximal normal subgroup of P_i. At the bottom of page 125 occurs simple for single.

In the author's presentation of the ideas introductory to the general Galois theory of equations, he has not maintained the usual excellence of his text, although he has avoided the gross errors of certain texts. The fundamental distinction between formal and numerical invariance is relegated to a foot-note! To the author there are just two alternatives, either the coefficients of an equation are all independent variables or are all particular numerical constants. We find the unfortunate statement at the bottom of page 125 that an equation "may represent a more general case when the coefficients are particular numbers than when they are variables." These two cases are merely the opposite extremes of the general case of Galois's theory, a point so obvious that we need not dwell on it further. The same remarks apply to page 2; furthermore, there is no reason why π or e may not enter the coefficients in Galois's theory. If the foot-note on pages 124–5 had been entirely omitted and the statement made that throughout Chapter XI the roots were regarded to be independent variables, so that "unaltered in value" means "formally unaltered," the presentation would be very satisfactory. In fact, the author has closely followed Weber in the presentation of the general Galois theory. There is a trivial discrepancy between § 121 and exercise 2. In § 159 the theorem should be given the precision found in exercise 5. Let M be a rational function of the n roots with coefficients in the domain Ω. Let M be formally unaltered by the substitutions of a group Q and by no further substitutions on the n roots. If the conjugates of M under the symmetric group are all numerically distinct and if M is a number in Ω, the Galois group for the domain Ω is either Q or one of its subgroups.

The text furnishes interesting applications to cyclotomic equations; geometric constructions by ruler and compass, in particular to the possible divisions of the circle into equal parts; the duplication of the cube; the trisection of an angle.

L. E. DICKSON.

Annuaire Astronomique pour 1905. Hayez, Brussels, 1904. 16mo. 360 pp.

THIS handy little volume, published annually under the auspices of the Royal Belgian Observatory, would perhaps scarcely be a suitable subject for notice in these columns if the Society did not contain amongst its members many who in addition to their mathematical duties have charge of observatories in which research work is necessarily entirely subordinate to instruction. For such it will be found useful to have on the table, along with the Nautical Almanac, its contents including besides the usual astronomical data, formulæ for finding the various terms in use, full explanations of the tables, worked examples, etc. It is published primarily to aid in the administration of the Belgian public service, to give assistance and information to all interested in astronomy, and to popularize the study of the subject. From the way in which it is written and put together it would appear to be successful in achieving these objects.

ERNEST W. BROWN.

NOTES.

THE annual meeting of the AMERICAN MATHEMATICAL SOCIETY will be held on Thursday and Friday, December 29–30. The Council will meet on Thursday morning, and the annual election of officers and other members of the Council will close on Friday morning. At the opening of the afternoon session on Thursday, the retiring President, Professor THOMAS S. FISKE, will deliver the presidential address, the subject of which will be "Mathematical progress in America."