

BOOK REVIEWS

The new elements of mathematics, by Charles S. Peirce, Carolyn Eisele (editor), Humanities Press, Atlantic Highlands, N.J., 1976, cxxxviii + 2478 pp., \$283.00. Four volumes in five books:

Vol. I, *Arithmetic*, xl, 260 pp., \$31.00.

Vol. II, *Algebra and Geometry*, xxxi, 672 pp., \$76.00.

Vols. III/1, III/2, *Mathematical Miscellanea*, xxix, 1153 pp., \$128.00.

Vol. IV, *Mathematical Philosophy*, xxviii, 393 pp., \$48.00.

Charles S. Peirce, 1839 to 1914, was one of America's most outstanding intellects. Philosopher, mathematician, and scientist, he wrote profusely, the equivalent of almost 100,000 printed pages in all. He was able to publish only about one-seventh of this, and most of his writings in mathematics and logic were never published during his lifetime.

The *Collected papers of Charles Sanders Peirce* appeared from 1931 to 1958; volumes 1 to 6 were edited by Charles Hartshorne and Paul Weiss (1931–1935), and volumes 7 and 8 by the present writer (1958). While these volumes included some previously unpublished papers in mathematical logic, by design they included almost none of Peirce's other papers in mathematics, nor his drafts of textbooks.

Carolyn Eisele, Professor Emeritus of Mathematics at Hunter College, has now filled this gap. She has edited about 2500 pages of the unpublished manuscripts, encompassing pure mathematics, numerous applications, and some rather ingenious textbook materials. *The new elements of mathematics* includes Peirce's papers on linear algebra and matrices, Euclidean and non-Euclidean geometry, topology and Listing numbers, graphs, and the four-color problem; also, his mathematical applications to economics, map projections, engineering, and the theory of errors. In addition, there are writings on the logic of relatives, Boolean algebra, and the nature of continuity; on probability, inductive logic, and applications of induction to historical inquiry. Finally, Professor Eisele provides most of Peirce's drafts of textbooks on arithmetic, geometry, and trigonometry.

Charles Peirce was the son of Benjamin Peirce (1809–1880), America's first original mathematician, whose *Linear associative algebra* appeared in 1870. Charles derived many results from his father's algebras, and he demonstrated their connection to relations (matrices).

Charles Peirce also proved a theorem about the rotation of bodies in four-dimensional space. But his most important mathematical results were in symbolic logic, a subject not generally accepted by mathematicians in Peirce's time. He developed the formalism of the propositional calculus and the general logic of quantifiers, independently of, though a little later than, Gottlob Frege. Independently of Dedekind, Peirce defined a finite set as one that cannot be put in one-one correspondence with a proper subset of itself.