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Writings of Charles S. Peirce: A Chronological Edition, Volume 2, 1867–1871. Editor in chief: Edward C. Moore. Bloomington, Indiana (Indiana University Press). 1984. xlviii + 649 pp. $35.00.

Reviewed by I. Grattan-Guinness

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> Now there is a demand for mathematics; it helps to build bridges and drive engines, and therefore it becomes somebody's business to study it severely. But to have a philosophy is a matter of luxury; the only use of that is to make us feel comfortable and easy. It is a study for leisure hours; and we want it supplied in an elegant, an agreeable, an interesting form.
>
> Peirce (p. 486)

The second volume in the new edition of Peirce's writings covers the activities around his thirtieth year. This biographical detail is curiously not mentioned by the editors, but they strongly emphasize and clearly outline the importance of the period covered here in his intellectual career. As a philosopher, he developed his critical stance against positivism and idealism; as a logician, he completed his first essays in his algebraic logic of "relatives"; as a scientist, he was appointed an "Assistant in Charge" of the Coast Survey. The three-part editorial introduction reflects this trio of activities, since its authors devote themselves largely to one each. The body of the volume is devoted mostly to the first two, however, since the policy of the edition as a whole is to concentrate on Peirce's philosophical and logical writings and refer the interested reader to editions already available of his other interests (pp. xii–xvi).

Peirce's major logical essay of this time is a well-known paper on "a notation for the logic of relatives," published by the American Academy in 1870 and again sixty years later in the so-called *Collected Papers* edition. D. D. Merrill provides an excellent brief introduction to the paper and its writing (pp. xlii–xlviii), and the reader benefits further by gaining access to newly published manuscripts on logic of the same period, which show the progression of ideas between earlier publications in logic (also reproduced here) and the 1870 essay. Broadly speaking, Peirce followed the inspiration of De Morgan in forming an algebra to express the logic of relations in some degree of imitation of algebras developed already in mathematics. One of the major tasks of his approach was to appraise the *correct* degree of appeal to mathematical theories in the construction of this logic: "+" could be like "or" and "×" like "and," as Boole already knew, and Peirce went to the lengths of using exponentiation to express relations, such as "l^w will be a lover of every woman" (p. 377), and so on, for example, the use of the binomial theorem and a certain version of infinitesimals (pp. 377, 395). Perhaps the most interesting manuscript is the note of 1871 on "the copulas of algebra," as guided by the

figures of syllogistic reasoning (pp. 451–456), somewhat in the tradition of earlier English writings on possible algebras in mathematics.

Peirce was probably writing in *conscious* imitation of his predecessors, since the volume contains various writings on British traditions: essays on De Morgan and Babbage, to frame the "copulas" piece (pp. 448–450, 457–461); an incomplete suite of lectures of 1869 on "British logicians" (pp. 310–345), largely comprising an interesting (and then pioneering) piece on Ockham and a rather disappointing appreciation of Whewell; some essays on Boole and Venn *passim*; and a review of the new Fraser edition of Berkeley's works (pp. 462–490). His awareness of British work will have been heightened by the travels in Europe that he undertook at that time; they are illustrated by the frontispiece photograph, which shows him with his father, a brother, and others in Sicily to observe the solar eclipse in 1870.

As the names just given illustrate, Peirce's interest in the British extended beyond their logicians to their philosophers. By and large his views were critical, even hostile, for he focused his attention on the positivistic and idealist traditions mentioned at the beginning of this review. As the matter belongs more to the history of philosophy than to the history of mathematics, only a summary notice is meet here, but the quality of his penetrations must be emphasized: a splendid sweep over English empiricism and the Scottish commonsense tradition, for example, in the remarkable review of the Berkeley edition (pp. 481–486). He also subjected Comte's positivism to a demolishing survey: "*The love of life is more than a love of sensuous life*: it is also a love of rational life" (p. 124). He understood well the importance of intellectual movements and also of their history: "Metaphysical history is one of the chief branches of history, and ought to be expounded side by side with the history of society, of government, and of war; for in its relations with these we trace the significance of events for the human mind," he noted early on in his review of Berkeley (p. 463).

A few comments are in order on the book as an edition as such. It meets the highest standards of both textual attention, editorial emendation, and typographical accuracy; the reader can rely on it with great confidence. However, the volumes would be more helpful if a few changes in principle were made. A variety of symbols is employed in the edition, some in the text; the explanation of each symbol would best be placed amid the relevant matter, and not in its curious location on pp. 583–584. The editorial notes (pp. 499–554) and textual commentaries (pp. 584–631) are most helpfully and conscientiously prepared, but they are rendered somewhat impotent by the failure to provide either a key-sign or lineation in the text; thus readers of the text are given no hint that an editorial point is supplied, nor are they helped in the converse move from apparatus to the corresponding line of text. It seems appropriate to raise questions of this kind in an edition of a thinker whose interests embraced semiotics (as this volume well reveals, incidentally).

Now that two volumes of the edition have been published, its importance can begin to be appreciated, and it is clear that not only is there new material of

interest, but even the known texts gain from the enriched contexts in which they are set. In an age such as ours, where mathematics and logic often degenerate into mere exercises and philosophy is so attracted to banalities such as private worlds and nothingness, the voice of a real thinker is all the more desirable.

Studies in the Exact Sciences in Medieval Islam. By Ali A. Al-Daffa and John S. Stroyls. Dhahran (University of Petroleum and Minerals); New York (John Wiley & Sons). 1984. $39.95.

Reviewed by David A. King

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The history of the exact sciences in medieval Islam is an exciting field for research. Primary sources are legion, and the bibliographical works of Suter, Brockelmann, and Sezgin serve as reliable guides; the secondary sources (mainly in German, French, Spanish, English, and Russian) reflect the sophistication and diversity of the achievements of the Muslim scientists. Most scholars in the field are involved in studying and editing original sources (*Quellen*), then translating or analyzing them (*Studien*).

The authors of the volume under review are on the faculty of the College of Sciences at the University of Petroleum and Minerals, Dhahran, Kingdom of Saudi Arabia, and perhaps it should be stated that the second author is a personal friend of this reviewer. The authors' approach to the history of Islamic science differs from that described above: essentially they attempt to gain new insights into the subject without consulting the primary sources for themselves. The inordinate number of errors in the transcription of Arabic personal names, titles, and technical terms indicates that the authors are simply not well versed in medieval Arabic and explains why they have generally preferred not to go back to the original sources. One detects throughout the book the hand of a competent mathematician and notes a meticulous citation of sources, but, this notwithstanding, the volume is a major disappointment.

Perhaps what disturbs me most about this volume is the pretentiousness of its title, which would be more appropriate for a volume in the *Quellen und Studien* tradition. The reader interested in serious research on Islamic science should consult the recently published volume of reprints of some seventy-five *Studien* by E. S. Kennedy, his colleagues, and students, bearing a title remarkably similar to that of the work under review [Kennedy 1983]. Most of Kennedy's studies are of the following format: (1) identification of some new source material or of some published material deemed worthy of investigation, (2) presentation of text or translation or summary, and (3) commentary. Those of Kennedy's papers which are not of this format are surveys based upon such studies. This is not an elitist approach: the consensus of scholars in this field for the past 150 years has been