had arisen from it. He proceeds to observe: 'the present state of mathematics is anomalous and deplorable. The light of truth no longer illuminates the road to follow.' The attitude is clear, but it can exaggerate the historical record, as when Gödel's results are described as a 'disaster' (p. 263).

In short, although Kline's later book goes into more detail on the history of logic than the earlier survey, his descriptions suffer from his extreme position as applied mathematician. After referring to G.H. Hardy and L.E. Dickson, he writes, 'Their pure mathematics, like all mathematics created for its own sake, will almost certainly not have any use. However, the possibility is not out of the question...a monkey who types letters at random may produce a play of Shakespearean quality' (p. 296). Kline's zeal obscures his perspective. That zeal is less obtrusive in *Mathematical Thought*, which will remain, for completeness if not for balance, a standard reference.

IN MEMORIAM – WILLIAM C. KNEALE

IRVING H. ANELLIS

Modern Logic Publishing
Box 1036, Welch Avenue Station
Ames, IA 50010-1036, USA

and

THOMAS DRUCKER

304 South Hanover Street
Carlisle, PA 17013-3938, USA

William C. Kneale, who with his wife Martha wrote *The Development of Logic* familiar to all English-speaking historians of logic, died on 24 June 1990. He was 85 at the time of his death. Kneale was better known to his colleagues at Corpus Christi College, Oxford, as a philosopher of science and the author of a book on *Probability and Induction* (1949) which gives an account of the range theory of probability. He was a Fellow of Exeter College, Oxford, and in 1965 succeeded to the White Professorship of Moral

Philosophy previously occupied by the linguistic philosopher J.L. Austin. He retired in 1966.

Kneale's interest in history of logic began in the 1940's, when his study of probability theory led him to the work of Boole. His first major publication in the history of logic was his paper "Boole and the Revival of Logic," published in *Mind* in 1948. The paper grew out of a lecture delivered to the Moral Sciences Faculty of the University of Cambridge on 13 November 1947, on the occasion of the centenary of Boole's *Mathematical Analysis of Logic*, and evoked in Kneale the idea of writing a general history of logic. In his paper, Kneale expressed the opinion that the most original part of Boole's *An Investigation of the Laws of Thought* was the application of logical ideas to the calculus of probability; otherwise the *Investigation of the Laws of Thought* added nothing to Boole's contributions in his *Mathematical Analysis of Logic*. This view was reiterated eight years later in Kneale's paper "Boole and the Algebra of Logic" which appeared in the *Notes and Records of the Royal Society of London* in 1956. The most important of Boole's contributions from the perspective of logic, according to Kneale, was what Boole called "elective functions", which we have come to call truth functions.The primary focus of both of these papers, however, was to examine Boole's legacy in the context of the logic of Boole's day and evaluate the impact and importance of Boole's work for the logic of our own time. Within this framework, Kneale's basic task was to give an explication of the central ideas and apparatus of Boole's logical calculus.

Parts of the 1948 paper on Boole were incorporated into *The Development of Logic*; likewise, his 1956 paper "The Province of Logic" dealing with the history of natural deduction, was incorporated into the book. Kneale was also the author of a number of papers in philosophy of logic, particularly on the nature of truth for natural languages, and including a philosophical discussion of the role which linguistic concepts play in the treatment of logical paradoxes.

Kneale worked on his big history of logic from 1947 to 1957 together with his wife, who was responsible for the chapters on the work of the ancient Greeks. The result was their *magnum opus*, *The Development of Logic*, which first appeared in 1962 and which went through five impressions in the succeeding decade before going into a second, paperback, edition in 1984. The fifth impression, appearing in 1971, contained only minor revisions and corrections, along with the addition of an appendix containing translations of the Latin texts quoted in Chapter IV. Some additional minor corrections were made for the 1984 edition. Benson Mates, who reviewed both the first impression and the second edition for the *Journal of Symbolic Logic* (vols. **27** (1962), 213 and **51** (1986), 476, respectively), wrote in his review of the second edition that the alterations were so minor that he needed only to repeat what he had said about the book when it first appeared. Mates said that the expository portions of the history, which comprised the bulk of the book, were "generally lucid and reliable," while the portions in which the authors present their own interpretations, that is, where they "argue with the historical figures," setting out their own

philosophy of language or establishing their own system of predicate logic, "are less satisfactory." He notes that the volume is "beautifully written and eminently readable" and "seldom indeed has a scholarly project been done so well the first time around." Another indication of the value of this work is that it was translated into Italian in 1972.

Some flavor of *The Development of Logic* is given by the fact that Aristotle and Frege each receive 78 pages of discussion out of 742 pages of text, and no one else receives nearly so much attention. A quick glance at Kneale's (1956) article "Gottlob Frege and Mathematical Logic" might suggest that Kneale found Frege's influence pernicious. It is safe to claim that Kneale did not have unreserved admiration for the effects of mathematical philosophy in other areas of philosophy. Nevertheless, his enthusiasm for Frege's achievements in logic was unfeigned: as he remarks in *The Development of Logic* (p. 512), Frege's "achievement was so great that a large part of what comes after can be reviewed most conveniently in relation to his work." His examination of the *Begriffsschrift* led him to conclude (p. 511) of modern logic that "1879 is the most important date in the history of the subject."

Kneale's appraisal is not always wholly accurate, and in some cases conspires to diminish the impact of his admiration for Frege's accomplishments. In "Gottlob Frege and Mathematical Logic," Kneale (p. 33) remarks, for example, that Frege did *not* offer a *characteristica universalis* in the Leibnizian sense as a language "which is supposed to help scientific thought by exhibiting the articulation of all complex ideas." But Frege intended the *Begriffsschrift* to be precisely a *characteristica universalis* in this Leibnizian sense, as he wrote in his 1882 paper "Über den Zweck der Begriffsschrift."

Jean van Heijenoort used the Kneales's history as a reference in his logic courses, even making it required reading in preparation for the Logic Comprehensive Examinations at Brandeis University. He compared their history to N.I. Styazhkin's *Formirovanie matematicheskoj logiki* (1967) when he reviewed the latter in the *Journal of Symbolic Logic* **33** (1968), p. 465. Van Heijenoort thought that Styazhkin's history gave more detailed treatment to secondary figures than "Kneale and Kneale" and was especially good, by contrast, on the period between between Leibniz and Frege. His review describes the Kneales's history as more argumentative and engaged, thereby leaving itself more open to differences of opinion than was Styazhkin's work.

With the exception of Ivo Thomas's English translation of I.M. Bocheński's (1960) *Formale Logik*, which appeared under the title *A History of Formal Logic* a year earlier (in 1961) than the Kneales's history, "Kneale and Kneale" was the only major history of logic available in English in the mid-twentieth century, and was in fact the first major history of logic in English to take account of new developments in logic since the appearance in 1906 of A.T. Shearman's *The Development of Symbolic Logic: A Critical-Historical Study of the Logical Calculus* and the first edition of C.I. Lewis' *A Survey of Symbolic Logic* in 1918. As Benson Mates predicted, the treatise has been a standard work for decades.

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IN MEMORIAM – GEORGE FREDERICK JAMES TEMPLE

George F.J. Temple died on 30 January 1990 at age 90. He was Professor of Mathematics at King's College, London from 1932 to 1953 and Sedelian Professor of Natural Philosophy at Oxford from 1953 to 1968. His primary area of researches were mathematical physics, especially quantum theory and aerodynamics. He was also a fellow of the Royal Society and a member of the London Mathematical Society (LMS). He served on the council of the LMS from 1932 to 1937, its librarian from 1946 to 1951, its vice-president from 1933 to 1935 and from 1953 to 1954, and its president from 1951 to 1953.

Temple's interest in history was formed late. On 17 December 1971, he delivered the inaugural lecture to the newly formed British Society for the History of Mathematics on the topic "Geometry from Riemann to Whitehead." As an emeritus professor, he devoted much of his time to writing his book *100 Years of Mathematics: A Personal Viewpoint* (New York, Springer-Verlag New York and London, Duckworth, 1981). This history, written for the working mathematician, covers the period from 1870 to 1970, with excursions as required for continuity and background into the mathematical developments of the mid-nineteenth century. It begins with Part I, on "Numbers", devoted to a consideration of the history of infinitesimals, the real numbers, and the transfinite numbers, viewed from the standpoint of foundations of analysis. Part II, on "Space", traces the developments from the development of multilinear algebra to its application to geometry and along the