Gottfried Wilhelm Leibniz, *Ricerche generali sull'analisi delle nozioni e delle verità e altri scritti di logica* [*General Inquiries about the Analysis of Concepts and of Truths and Other Writings in Logic*]. Edited and translated into Italian, with introduction and commentary, by Massimo Mugnai. Pisa: Edizioni della Normale, 2008. Pp. 262.

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The volume under review presents, in Italian translation, six of Leibniz's most important papers in formal logic and its foundations, which Massimo Mugnai accompanies with a 57-page introduction, 86 pages of commentary, and an appendix explaining the elements of classical (broadly Aristotelian) logic. By far the longest of the six papers is "General Inquiries about the Analysis of Concepts and of Truths" (A VI, ivA, 739-788 / P 47-87), which Mugnai describes as "the largest and most complex work that Leibniz devoted to logic" (40). The other five are "Foundations of Rational Calculus" (A VI, ivA, 917-922), "On the Abstract and the Concrete" (A VI, ivA, 987-994), "Some Logical Difficulties," (GP VII, 211-217 / P 115-121), "A Not Inelegant Specimen of Demonstration in Abstract Matters," (A VI, ivA, 845-855 / P 122-130), and "Calculus of Coinciding and Inhering" (A VI, ivA, 830-845 / P 131-144).[1] The scholarship is meticulous; the translations have been made from the critical text in A VI, iv, where that is available. Where it is not available, in the case of "Some Logical Difficulties," the translation is based on the original manuscript, and incorporates some amendments of Gerhardt's text.

The introduction and commentary by Mugnai provide a companion, of exceptional value, to the study of the texts. Each of the six texts is immediately followed by commentary on it; the commentary is shorter than the text in most instances, but longer in the case of "General Inquiries." In form, each commentary is a series of notes, keyed to numerical flags in the text. Many of the notes are devoted to explaining, very helpfully, Leibniz's terminology, setting it in its historical context and its context in Leibniz's thought, and giving useful references to other texts. Some of the notes on "General Inquiries" are quite long; note 8, for example, amounts to a 12-page essay on Leibniz's treatment of relations in metaphysics and logic. Studying the texts with Mugnai's comments provides a detailed and historically grounded understanding of them that would not easily be obtained otherwise.

Mugnai's introduction to the volume provides a concise but comprehensive, rich, and illuminating account of Leibniz's contributions to logical theory and their place

in the history of the subject. The main departure from medieval Aristotelianism in logic that he sees exemplified in Leibniz is a sort of mathematization of logic. Whereas the Middle Ages had kept the disciplines separate, "logic in the *trivium*, mathematics in the *quadrivium*," thinkers in the late sixteenth and early seventeenth centuries began to assimilate them. The algebraic notation using letters as symbols, introduced by François Viète (1540-1603), provided a model of the use of variables that could be adapted for use in logic. Leibniz was able to cite Thomas Hobbes as a precedent for treating logic as a sort of calculus or "computation" (10-12).

Mugnai sees the novelty of Leibniz's treatment of logic in the richness of his detailed development of logical calculi, and in his project for a "characteristic." By 'character', as Mugnai shows, Leibniz means a symbol, "a visible mark that represents thoughts" (65, citing A VI, ivA, 916). The characteristic, then, was to be a system of symbols representing thoughts. Mugnai argues, with textual support, that it was to be a system of great generality and flexibility, capable of diverse interpretations of its symbols "so as to generate now an algebraic calculus in the strict sense, now a logical calculus, now a geometrical calculus, and so on" (13). This systematic conception is doubtless of greater significance than Leibniz's relatively incidental anticipations of ideas of modern logic such as that of a referentially opaque context (32) and a rule against employing a letter already used in the context when introducing a variable (29).

Mugnai gives an extensive and illuminating account of the reception of Leibniz's work in logic, from his death until the beginning of the twentieth century (40-54). He notes the unfinished character of Leibniz's logical writings, and the fact that with few exceptions they remained unpublished for many years after Leibniz's death, so that "only in 1903, when Louis Couturat published the *Opuscules et fragments inédits*, would it be possible to assess correctly the value of Leibniz's legacy in the realm of logic." Mugnai argues, nonetheless, that by the middle and later years of the nineteenth century enough of Leibniz's logical papers had been published to give "an idea, still partial but already informative, of the results obtained by Leibniz in the logical field," and that Leibnizian ideas had an influence in that period on German writers on logic such as Bolzano, Grassmann, and Frege (41-42).

Even so, Mugnai does not claim that the remarkable development of symbolic logic in the nineteenth and early twentieth century was derived from Leibniz's discoveries. In his view it is rather the achievements of the more recent logicians that first made it possible to see clearly the significance of the points on which Leibniz anticipated their work. It was because in the nineteenth century "traditional

logic had given way to mathematical logic, [that] the pressure to come to terms with Leibniz, who had prophesied so insistently the 'mathematization' of logic, had become powerful" (42). As Mugnai puts it with reference to the British mathematical logician George Boole,

> in the logical writings of Leibniz there are almost all the fundamental ingredients for the construction of what we call today "Boolean algebra." This, however, is a matter of "scattered" ingredients, which were never consciously brought together in a whole, *disiecta membra* of a structure that we are in a position to reconstruct, in its complexity, since we have caught a vision of the form in its entirety, thanks to Boole and the algebrists of the late nineteenth century. To attribute to Leibniz the discovery of Boolean algebra is therefore, from a rigorous historiographical point of view, nothing but an anachronism (46).

I have indicated only a sample of the resources that the book offers to students of Leibniz's logic.

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Note

[1]P = Leibniz, *Logical Papers*, trans. and ed. by G. H. R. Parkinson. Oxford: Clarendon Press, 1966. In giving titles of the papers in English I have been guided primarily by Mugnai's Italian titles for them, but have allowed myself to be influenced at some points by Parkinson's English titles. Half the papers got no title from Leibniz in the first place, and have received them only from editors and translators.