The Review of Modern Logic
Volume 10 Numbers 1 & 2 (September 2004–February 2005) [Issue 31], pp. 7–65.

RICHARD MILTON MARTIN: AMERICAN LOGICIAN

PHILIP MEGUIRE

Abstract. In his 1941 Ph.D. thesis, written at Yale under Frederick Fitch, the logician and analytic philosopher Richard Milton Martin (1916–85) discovered virtual sets before Quine, and was possibly the first non-Pole other than Woodger to employ a mereological system. From these and other devices, he gradually forged a first order theory capable of expressing its own syntax as well as some semantics and pragmatics (via an event logic), all while abstaining from set and model theory (consistent with his nominalist principles) and from modality and other intensional notions. Between 1943 and 1992, Martin published 16 books and about 240 papers (of which 179 were included in his books) on logic, linguistics, mathematics, metaphysics, the semiotic triad, science, phenomenology, theology, Frege, Peirce, and Whitehead. The young Chomsky took every course Martin taught at Penn, and Quine's *Word and Object* [Quine (1960)] cites Martin with approval. Yet no reference work on twentieth century philosophy has an entry under his name—hence this paper.

"... one of the most many-sided, prolific, and scholarly of analytic philosophers."

Hans Burkhardt, Foreword to [Metaphysical].[1]

"Over the portals of the entrance to contemporary philosophy is writ: Enter here fully equipped with the tools of the new logic."

[Intension, p. 153].

"God made first order logic and all the rest is the handiwork of man."

[Semiotics, p. xv].

I thank Warren Goldfarb, Peter Hare, Nathan Houser, Kenneth Laine Ketner, Joseph Ransdell, Israel Scheffler, and Joseph Ullian for advice, encouragement, and references, and in some cases, for granting me access to archives they control.

Received 6/15/2004. Revised 12/23/2004.

[1]I cite a book by Martin by the first word in its title, followed by a chapter number if relevant. I cite Martin's articles by the last two years of the date of publication, separated by a period from the number of the article in the Bibliography of Martin's Shorter Writings at the end of this article.

1. Introduction

I began this essay upon discovering that Google turned up nothing about the American logician and analytic philosopher Richard Milton Martin. My determination to complete it increased sharply when no encyclopedia and biographical dictionary of philosophy I consulted contained an entry for Martin; at best, they would cite Martin once or twice. This reticence holds even for the otherwise worthy *Handbook of Metaphysics and Ontology* [Burkhardt & Smith (1991)], coedited by the author of the above laudatory quote.[2]

Martin wrote 16 books containing 179 papers. The books can be broken down into four monographs, 11 collections of papers, and one book mixing the two formats. He wrote another 60-odd papers not reprinted in his books. His work touched on an extraordinary range of subjects: formal semantics and pragmatics, metaphysics, mathematics, linguistics, science, art, Peirce, Frege, Whitehead. Since 1970, according to the Web of Science, his books have been cited about 100 times and over 110 articles have cited his work. Quine [Quine (1960), 90] praised Martin's notion of "multiple denotation" as set out in [Truth, 4], and Quine's ([Quine (1969)], [Quine (1982)]) texts cited Martin's codiscovery of virtual sets. His impact, however, has not been commensurate with the breadth and depth of his writings; the secondary literature on Martin is little more than reviews of his books. To my knowledge, the only texts on mathematics or logic to cite Martin, Quine's excepted, are [Curry (1963)], [Kneebone (1963)], and [J. N. Martin (1987)]; these citations are all perfunctory. This comparative silence, as puzzling as it is broad-based, begs elucidation.[3]

After setting out some facts about Martin's career, I discuss his idiosyncratic "logic" at some length. I then survey some of the many topics to which he applied that logic, showing that Burkhardt's encomium, cited at the head of this essay, and his praise of Martin's *methodological flexibility* and *liberality of topics*, were not just mere eulogistic good manners (*de mortuis nil nisi bonum*) but fully deserved.

This essay is "partial" in three senses of that word. First, I do not have access to some of Martin's articles, and have not even inquired as to whether he left a *Nachlass*. I do not know whether he appointed

[2]The only work by Martin cited in the *Handbook* (in the article on the analytic/synthetic dichotomy) is [Notion], obscurely published and otherwise almost never cited. Curiously, the *Handbook* did not cite [52.1], Martin's much better known article on the same subject. If a reference work cites Martin at all, it is usually for his work on events, especially his [69.1].

[3]For an instructive contrast, type 'Wilfrid Sellars' into Google. Also see §5 below.

a literary executor, nor have I contacted his extended family. Second, I knowingly present an incomplete picture of Martin's achievement, in that I linger over the logician, the aspect that first drew me to him, while my discussion of the philosophical use he made of his logic is little more than a stock-take. In particular, I only mention Martin's ample work in *logico-linguistics*, his term for the formal study of language using logic. I invite others to step into this breach. Finally, as I am neither linguist nor professional philosopher, it is not my place to evaluate critically Martin's work.

Appended to this essay are bibliographies of Martin's writings and of the secondary literature on Martin, including reviews of his books, and an index of the logical and mathematical topics touched on by Martin's essays published as book chapters. The scope of this index includes much of the analytic side of his philosophical interests. I went to this trouble because the subject indices to his books are either lacking or leave something to be desired. It is my earnest hope that my index will motivate others to study critically Martin's logic, philosophy, and mathematics, and best of all, to extend them.

2. Martin's Life and Career[4]

What [Lowinger (1941), 1] said of Pierre Duhem can also be said of Richard Martin: "The factual background was very simple, as is often the case with those who are essentially men of thought rather than men of action." Born of Frank and Lena Bieder Martin in 1916, Richard was educated as follows:

- B.A. Harvard, 1938, majoring in philosophy;
- M.A. Columbia, 1939;
- Ph.D. in Philosophy, Yale, 1941. Frederick Fitch supervised his thesis.

At Harvard, Martin studied under C. I. Lewis, and may have been one of Quine's (who began teaching in 1936) first students. I have no specifics about Martin's time at Columbia, other than what can be surmised from his having dedicated [Toward] to "Ernest Nagel my teacher and friend." At Yale, Martin met Jacques Maritain and may have taken courses taught by Paul Weiss, the coeditor of the first six volumes of Peirce's *Collected Papers* and founding editor of the *Review of Metaphysics*. During the war, Martin taught mathematics, first at Princeton, then at Chicago. After the war, he taught philosophy at

[4]Unless otherwise stated, my sources are Martin's entry in *Who's Who*, a copy of his CV included in an application (#SES-8117110, dated 9/4/81) for an NSF grant, and the obituary notices by Silber [Silber (1986)] and Kline [Kline (1986)].

Bryn Mawr. In 1948, he married Marianne von Winter (1923–89), a native of Austria and an academic art historian.

Martin was part of the first wave of American analytic philosophers; arguably, only Quine (1908–2000), Fitch (1909–1987), and Henry Leonard (1905–67) preceded him. His chronological elders Nelson Goodman (1906–1998) and Wilfrid Sellars (1912–89) were arguably his contemporaries, as they all began their careers in earnest at about the same time, namely right after the Second World War. In 1948, Martin moved to the University of Pennsylvania (Penn), where his philosophy colleagues included Goodman, Israel Scheffler, and Morton White. Also at Penn at the time were the linguists Zellig Harris, whom Martin came to admire, and Henry Hiż, whose work Martin would later scrutinize critically. While a student at Penn, 1945–51, Noam Chomsky took every class Martin taught, and names him and Zellig Harris as major influences.[5] From 1950 to 1955, Martin was a consultant to the Philadelphia marketing consulting firm Alderson and Sessions.

Seventeen years after finishing his Ph.D., Martin published his first book, an unusual delay by American academic norms. The following year (1959), he published two more books and was appointed a full Professor at the University of Texas, where he wrote [Intension]. During 1962–63, he and Charles Hartshorne were colleagues. From 1963 to 1973, Martin taught at New York University, while publishing [Belief] and [Logic] and holding visiting appointments at Bonn, Yale, Hamburg, the New School, and Temple.

In 1973, he took up a position at Northwestern but made little impression on that department, as starting in 1976, he taught there only one quarter each year. He made excellent use of the resulting leisure, so that the final decade of his life was by far the most productive. He helped edit the Fitch [Findlay] *Festschrift*, published in 1975 [1985]. In 1979, he published the definitive treatment of his logic, Part A of [Semiotics], and edited a volume of Carolyn Eisele's writings on C. S. Peirce. Most telling of all is that during that final decade, he published over 100 book chapters and journal articles.

In 1977, Martin became a Research Associate with Boston University's Center for the History and Philosophy of Science, the university where his spouse taught art history. Thus his colleagues of his last years included Robert Cohen and Abner Shimony. At the time of his death, he served on the Editorial Board of eight journals and on the

[5]Source: Chomsky, personal communication dated 12.21.03, and R. F. Barsky's online biography of Chomsky at `http://cognet.mit.edu/library/books/chomsky/chomsky/2/2.html`.

Advisory Board of the Peirce Edition Project. In 1981, Martin served as President of the Charles S. Peirce Society. In 1984, he presided over the Metaphysical Society of America.

Richard and Marianne Martin had no children, but have descendants through Richard's siblings. Upon her death in 1989, Marianne bequeathed much of her estate to Harvard's Philosophy Department, as per Richard's wishes. The Department was surprised by this bequest, as Richard had not interacted with it since finishing his B.A. in 1938.[6] The nearest thing I have been able to find in the nature of a connection between Martin and his undergraduate *alma mater* is his having dedicated [Belief] to "Van Quine, in gratitude for the high standards of clarity in logico-philosophical writing he has set for our time." In any event, the bequest endows the Richard M. Martin Graduate Fellowship in Philosophy.

Despite having held tenure track appointments in universities from 1948 until his death, the only Ph.D. thesis completed under Martin's supervision appears to have been [Scoggin (1981)].[7] Scoggin's only article, his [Scoggin (1978)], cites five works by Martin and its substance and style are very much in the Martin vein. Otherwise, Martin's published writings, a tentative bibliography of which can be found at the end of this essay, constitute the whole of his legacy. Although only five of his books are in print as of this writing, his other books are very easily identified thanks to the online catalog of the Library of Congress. His first four books ([Truth], [Toward], [Notion], and [Intension]) and Part A of [Semiotics] are monographs. His other books are fairly loose collections of a total of 179 papers, a good many of which were already published elsewhere.

Putting together the bibliography of Martin's journal articles, book reviews, and abstracts appended below proved more challenging, the Philosopher's Index notwithstanding. For starters, that Index lists his work under three different names. Moreover, there are several persons named "R.M. Martin" publishing in humanities and social science, including the philosophers Rex M. and Robert M. Martin, who have also published on topics that would have interested Richard, e.g., language and metaphysics. The online indices omit several abstracts Martin published in *The Journal of Symbolic Logic*. His book reviews proved

[6]Source: Warren Goldfarb, personal communication dated 11.15.02, and the copy of Martin's will in the files of the Peirce Edition Project.

[7]I first encountered Scoggin's name in [Semiotics], which twice cites his thesis in progress, but have been unable to contact him. Alex Orenstein (personal communication 1.4.04) began a thesis under Martin, but finished it under Henry Hiż while Martin was on sabbatical.

especially elusive, although I managed to uncover 15. [Metaphysical] is his only book to include a reference list; [Pragmatics], the only one to cite, where applicable, the earlier published version of its chapters. Where I have determined that a book chapter is a revision of a previously published journal article, the bibliography states that fact.

While I am very fortunate to possess a copy of Martin's CV as of early 1981, as it includes a number of items not listed in the Philosopher's Index (e.g., articles in European journals, chapters in conference proceedings, work published in other disciplines), that CV includes a number of erroneous and incomplete entries. Moreover, even after four days' work in the Library of Congress and extensive use of interlibrary lending, I was unable to verify several publications Martin claimed on his CV. I would be most grateful if any items that should appear in the primary and secondary bibliographies, but that I overlooked, were brought to my attention.

3. Martin's All-Purpose First Order Theory

3.1. **First Order Logic, Nominalism, and Formal Syntax and Semantics.** Martin's Ph.D. thesis, whose contents became (43.1), his maiden article, established four methodological tendencies that proved lifelong:

- A base logic consisting of *first order logic with identity*, devoid of intensional notions;
- A professed *nominalism* and a corresponding distaste for set theory;
- The theory of *virtual sets and relations*;
- The *Boolean calculus of individuals* (hereinafter BCI).

Martin's base logic was a conservative one, invariably first order logic with identity, presented axiomatically in the pre-WWII style,[8] with *modus ponens* and generalization as the rules, and lacking even the semantic turnstile. Many of Martin's contemporaries, including his mentor Fitch, adopted natural deduction circa 1950, but that technique, as well as the more recent one of refutation trees, is absent from Martin's work. I cannot find a single citation in Martin's work of the

[8]Martin's truth functional axioms were those of *Principia Mathematica* (*PM*), as revised by Bernays. Obtain a more economical set by replacing the Martin's last two axioms with the transitivity of the conditional; the result is a nice three-axiom set [Tarski (1956), 43] attributes to Lukasiewicz. Martin's axioms for quantification, the hoary chestnuts Russell proposed in 1908 [Quine (1982), 234], require the rule of generalization and do not have the immediacy and simplicity of methods (e.g., the *main method* of [Quine (1982), §§30, 31]) that primarily instantiate quantified variables.

classic papers by Gentzen or Jaskowski. For that matter, after his [43.1], proofs largely vanish from Martin's oeuvre. He preferred to motivate and state "rules" (axioms, in truth, not inference rules) and then to list without proof a number of consequences of those rules, giving little clue as to how they were derived. All this is not to say that he was quaint and rigid in his choice of tools; in later life, he struck out in new technical directions, writing on the logic of relations ([Peirce's, 2–4, 6], [Mind, 9], [Metaphysical, 13], [Logical, 8, 13]), to which his study of Peirce naturally led him, and on combinatory logic[9] ([Metaphysical, 13, 17, 20], [Logical, 13]).

By "first order" Martin meant that all individuals are of one type; in his [43.1] and sometimes later, he employed the adjective "homogeneous" to the same effect. In some respects, such as the then-prevalent desire to improve on *PM*, [43.1] reminds one of the early Quine. His maiden article also employed a technique he called "ancestral quantification," replaced in his mature work by his notion of *ordinal individual*, in effect the ordered pair taken as primitive.

Martin never explicitly distinguished canonical bivalent first order *logic*, in which all atomic formulae are uninterpreted, from a first order *theory* built on such a logic, in which the predicates, primitive and defined, are interpreted, and governed by extralogical axioms. Indeed, the classical "first order logic" which he opposed to nonclassical varieties, was just such a first order theory, employing a rich variety of mereological and event logical predicates. By including extralogical predicates in his version of classical logic, Martin was being less that fair to nonclassical logics. He had, in effect, seized the high ground by not granting the proponents of nonclassical logics an opportunity to suggest their preferred extralogical predicates. After his [43.1], Martin wrote two more extended treatments of his first order theory, [Truth, II] and [Semiotics, 1–5]. The similarities of terminology, technique, even notation linking these treatments are indeed striking. [Semiotics, 1–3] is a thorough technical treatment of his mature first order theory.

[9]Gentle introductions to combinatory logic include [Rosenbloom (1950), §3.4] and [Smullyan (1990)]. Martin and [Quine (1982), §45] are among the rare philosophers to write about combinatory logic, by and large the brainchild of Haskell Curry. Quine was the less enthusiastic of the two, believing that its key philosophical insight—that first order logic could be exposited without variables—could be attained more simply by recasting that logic in terms of *predicate functors* (on which see [Quine (1982), §45], and references therein). Martin [Mind, 8] had reservations about Quine's predicate functors, proposing [Mind, 9] an alternative thereto based on virtual relations.

For nontechnical treatments thereof, in the nature of manifestos, see [Belief, 1], [Logic, 1], [Pragmatics, 21], and the Preface to [Semiotics].[10]

Martin repeatedly asserted that he practiced philosophical logic, yet much of what has appeared under that heading in recent decades (e.g., relevant, entailment, nonmonotonic, substructural) he either derided or passed over in silence.[11] Martin very much shared Quine's ([Quine (1986)] and elsewhere) conservatism about the content and methods of logic, including Quine's skeptical attitude toward the modern revival of modal logic [Belief, 3]. Martin was quite aware that his attitude toward the proper scope of logic paralleled Quine's; see his [Belief, 2] and [Events, 10]. He ended [Whitehead's, 5] by quoting, with evident approval, Whitehead's notorious dictum "One God, one country, one logic."

As for Martin's strong belief in the adequacy of the first order theory described here, I can do no better than quote the close of his Preface to [Pragmatics]:

> It is often claimed that first order logic has been tried and found wanting, as a result of which many deviant brands of logic have come on the market clamoring for attention. [My] argument, however, is that deviant logics are not needed and that this claim is ill-founded. Whenever classical logic is really put to the test, in a suitable applied form as required in a given context, it has been found to be a philosophical and scientific tool of great analytic power. [My purpose is to] lead the reader to a deeper understanding of the extraordinary riches of classical, first order logic and its extensions, which even now, a full century after Frege's discovery of the quantifiers in 1879, are largely unrecognized.

The philosophical driving force behind much of Martin's first order theory was his thoroughgoing nominalism. Following [Burgess & Rosen (1997)], contemporary "nominalism" should not be seen as a harkening back to the well-known dispute among medieval philosophers, pitting nominalists against realists. Rather, contemporary nominalism is a philosophical stance re logic and the foundations

[10] [Bacon (1972)], [Power (1975)], and best of all, [Cocchiarella (1981)], all survey Martin's first order theory.

[11] On nonclassical logics see, e.g., [Restall (2000)] and [Goble (2001), Chaps. 11–15].

of mathematics, asserting that all entities in the domain of quantification are of but one kind, namely they are all individuals. Nominalism deliberately precludes set theory and the model theory grounded thereon, higher order logic, and intensional notions innocent of extensional semantics. According to Burgess and Rosen, nominalism in this sense began with Nelson Goodman's papers of the 1940s (especially [Goodman & Quine (1947)][12], which Martin freely cited), culminating in the 1951 edition of his [Goodman (1977)]. In [Primordiality, p. 15], Martin approvingly quoted Goodman at length as follows:

> ... some of us are *not* willing to countenance ... abstract entities [such as sets and relations as values of quantified variables] at all (if we can help it), either because we are nominalists or because, for the sake of economy, we want to commit ourselves to as little as possible. If either nominalism or plain parsimony leads us to insist upon a logic that is not committed to abstract entities, then we shall have to forego a large part of the usual modern logic—namely most of the theory of classes and relations. This will indeed make the going hard, for it then becomes very difficult to express even so simple and fundamental a fact as that there are more cats than dogs. The difficulty of doing without a philosophically objectionable technique is not, however, sufficient reason for retaining it.
>
> [Goodman (1972), 39]

I propose that Martin's nominalism be taken in the sense just described, as an ascetic doctrine limiting logic to first order logic, and dispensing with set theory as a foundation for mathematics. Martin vigorously defended his nominalist stance from the criticisms of Hilary Putnam ([Events, 15]; [Metaphysical, 16, 19]).[13] In §4, I will say more about Martin's work on a nominalistic foundation for mathematics.

The outlines of Martin's syntactical and semantical theories, i.e., his inscriptional syntax, formalized semantics and metalanguage, his notions of designation and denotation (multiple and otherwise), nearly

[12]The notorious opening paragraph of this paper denied the existence of all the customary *abstracta* in logic and mathematics. [Goodman (1972), 156; first published in 1956] came to regret this flamboyant language, and [Quine (1980), 173–74, 1st ed. 1953] soon retreated to the realist fold.

[13]Martin served as advisory editor for the July 1978 issue of *The Monist*, whose topic was "Nominalism: Past and Present." That issue included [Scoggin (1978)], discussed in footnote 7. The only other contributor to cite Martin was [Eberle (1978)], but he did not engage Martin's work in any meaningful sense.

always first order, emerged in his [49.3], [50.2], [50.3], [51.1]–[51.4], [52.3], [52.5], [53.1], [53.3], [54.2], [58.2], [59.1], [62.2], and especially in his [52.2], read to the meeting of the Eastern Division of the APA. This series of papers first corrected and amplified his [43.1], then built on Goodman and Quine's [Goodman & Quine (1947)] and Quine's [Quine (1947)] suggestions for founding logic and mathematics on a nominalist syntax and semantics. This endeavor culminated in the four monographs Martin published over 1958–63, [Truth], his most fulsome and cited monograph, [Notion], [Toward], and [Intension]. Martin's formal treatment of syntax and semantics owed much to [Carnap (1942)] and [Carnap (1956)], and this debt was amply acknowledged. The Prefaces to his early books thanked Carnap for fruitful discussions, some of which may have occurred during 1952–54, when Carnap was at the Institute for Advanced Study in Princeton. Martin contributed a long chapter [63.2] to the Schilpp volume [Schilpp (1963)] devoted to Carnap. In his reply, Carnap largely agreed with Martin, elsewhere citing Martin three times. [Truth] also acknowledged a special debt to Joseph Woodger. Of the mere two coauthored papers Martin wrote during his entire career, one [51.3] was with Woodger.

Martin's formalization of syntax drew much from [Tarski (1956)], especially the latter's formal treatment of concatenation, while never mentioning Quine's [Quine (1951), Chap. 7] related technique of *protosyntax*, which Quine took from Tarski. In [Truth] and other early writings, Martin's attitude towards Tarski's theory of truth seemed open-minded and respectful. But eventually Martin's nominalism regained the upper hand, as in the following quote:

> It is usually thought that sets are essential in semantics, being presupposed fundamentally in Tarski's celebrated definition of the truth concept. Simpler methods are known, however, for providing for truth foregoing such powerful devices. And similarly for syntax and pragmatics. Hence there is no need for set theory as a foundation for the theory of truth and other areas of semiotic.
>
> [Whitehead's, p. 78]

Martin, never one to quail at citing himself, did not specify what simpler methods he had in mind, however. It is also not evident that a non-set theoretic semantics or pragmatics is necessarily "simpler" than one that employs sets and set theory, as denumerable sets are on balance rather elementary.

[Toward] proposed a formalized pragmatics in the spirit of Carnap, building on a predicate denoting *acceptance*,[14] and a purely *extensional* (also *denotational*, *designational*) interpretation of intensions. Here and in [Intension], the formalism relied in an essential way on the simple theory of types. [Truth], [Notion], [Toward], and [Intension] reveal a logician very dexterous at inventing atomic formulae to suit his purpose. For example, within the slim compass of its 100 pages, [Toward] introduced over 100 extralogical predicates; [Intension], over 80 in its 153 pages. Martin never deviated subsequently from the line set out in his early books, namely that some part of the metalanguage can and should be formalized.

In [Intension], Martin deepened his study of formal pragmatics by allowing the acceptance predicate to have a degree, a real number between 0 and 1. The formalism drew heavily on von Neumann and Morgenstern's [Von Neumann & Morgenstern (1944)] theories of games and of expected utility, and on the logical foundation for choice theory in psychology and economics proposed in [Davidson & *al.* (1955)]. [Intension] also broached the study of *intensional* semantics, proposing an extensional interpretation of intensions as virtual classes of virtual classes. I will say more about [Intension] in §5. Martin was not alone in seeking to build a first order formal language strong enough to formalize its own syntax and semantics, but devoid of intensional devices such as modal logic. But those who did so after him, e.g., Perlis [Perlis (1985)], [Perlis (1988)] and McCarthy [McCarthy (1979)], nowhere mention Martin's work, even [Truth] and [Semiotics]. Martin's final treatment of formal semiotics was his [Semiotics, 4–6], but I wish to note here the thorough and able restatement of a closely related theory in [Scoggin (1981), §§I.3–9].

[Truth] and [Notion] discuss metatheory in some detail. [Metaphysical, 15] is a startling and forthright statement of his skepticism about Gödelian incompleteness, on the supposed grounds that the formal semantics and pragmatics of Tarski, Carnap, and their disciples (presumably including Martin himself) qualified that result in a major

[14]The following "rules" from [Toward], *BR*1–4, *PragR*1–6, and *RF*1–4—all from §§III.B and IV.G—can be taken as axioms for Martin's formal pragmatics. [Barrett (1941), 307], citing [Morris (1938)], also advocated a formal pragmatics, but did not state axioms. Even though Martin and Barrett were colleagues at NYU for a decade, to my knowledge Martin never cited Barrett.

but unspecified way.[15] Metatheory is otherwise curiously absent from most of Martin's work, giving it a pre-Gödelian flavor.

Martin's mature perspective on logic and philosophy, beginning with [Belief], gave more importance to the CI [calculus of individuals], employing it to build an *event logic* based on event-descriptive atomic formulae whose variables range over a domain of events. The result was the first order theory he was to advocate forcefully in the 11 books and many articles he was to write over the remaining 16 years of his life. I now elaborate on the building blocks of that first order theory: virtual sets, CI, and event logic.

3.2. **Virtual Sets and Relations.** Martin's mature notation ([Semiotics, 1, 2]) for these is '$\{y \backepsilon \text{—}y\text{—}\}$', where y can be thought of as a vector of variables. If y is of dimension 1 [> 1], the abstract defines a virtual set [relation]. Given the first order logic formula '—y—' with y free, the context '$\{y \backepsilon \text{—}y\text{—}\}$' binds y. '$\{y \backepsilon \text{—}y\text{—}\}x$', where x is a vector of terms having the same dimension as y, means that '—y—' comes out true when some or all instances of y are replaced by x. (Quine writes '$x \in \{y : \text{—}y\text{—}\}$' to the same effect.) If '—y—' contains free variables other than y, and x and y are of dimension 1, then '$\{y \backepsilon \text{—}y\text{—}\}x$' defines a *virtual set function*. Virtual sets and relations (*virtuals*) are governed by the *principle of abstraction*: '$\{y \backepsilon \text{—}y\text{—}\}x \leftrightarrow \text{—}x\text{—}$', known to Frege and *PM*.

Letting '—y—' be '$y \neq y$' ['$\neg(y = y)$'] results in the universal [null] virtual set. Every virtual has a complement, relative to the universal virtual. Thus the world of virtuals is fully Boolean, in this respect being more akin to set theories admitting a universal set, e.g., Quine's NF, than to ZF set theory, which does not admit a universal set. The resemblance to NF goes no further than this, as the virtuals make no ontological commitment whatsoever.

[15]This skepticism of Martin's is indefensible, as he should have known of [Smullyan (1957)], which shows how little syntactical and self-referential machinery is needed to obtain versions of the limitative theorems of Gödel and Tarski. Anyone doubting these theorems should consult the short and gentle proof by Boolos (in [Hersh (1997), 311–16]), and the chapter by Smullyan in [Goble (2001)]. The latter makes clear that the limitative results only require diagonalization, and do not depend on the specifics of Peano arithmetic or Gödel numbering, or on recursive arithmetic of functions. Tarski's theorem (in any finitely axiomatized formal system strong enough for mathematics, there must be true but unprovable statements) is easier to prove than Gödel's and deserves to be better known. Martin would presumably reject what I say here on the grounds that it assumes set-theoretic machinery (e.g., Tarski's theory of truth) which contravened his nominalism. I invite the reader to judge just how much implicit set theory is embodied in Smullyan's presentation.

Because the virtuals are abstracts, and abstracts are but definite descriptions, everything the virtuals express can be expressed by first order logic alone.[16] At the same time, they can execute any office performed by *bona fide* sets and relations (*reals*) but one; the domain of a quantified variable may include reals but not virtuals. Hence virtual set theory makes an implicit case for open formulae.

Quine first set out his theory of virtual sets and relations in lectures given in Brazil and published in his [Quine (1944)]. He restated and extended that theory in his [Quine (1969), §1.3], [Quine (1982), §§21, 46], [Quine (1986), 68–74], each time duly acknowledging Martin's independent discovery thereof. Quine, however, made far less use of the virtuals than did Martin, who drew on the virtuals throughout his career, claiming [Belief, 6] that they sufficed for most philosophic purposes. This enabled him to dispense with set theory and its "heroic" ontology. In a passage criticizing Tarski's well-known definitions of truth and satisfaction, Martin argued against set theory as follows:

> The staggering wealth of deductive consequences of such [set theoretic] axioms should be noted—also its dubiousness ... Arguments against sets are legion. Sets are never needed in mathematics, if one takes a suitable constructive or quasiconstructive approach to it. To use set theory to explicate so essentially simple a notion as truth ... is to explicate a simple notion in terms of something much more obscure
>
> [Events, pp. 185–86]

Writing almost a decade earlier, Quine anticipated Martin's reasoning in the passage just quoted, then declined to make it his own:

> What [the virtuals] yield is substantial enough to implant new hopes, in many breasts, of making do with a nominalist ontology. Unfortunately, these would have to be breasts unmindful of the needs of mathematics [as the theory of virtual sets] affords no adequate foundation for classical mathematics, even of the positive integers.
>
> [Quine (1969a), 103]

But Quine then added "... because I think it good strategy in all subjects to postpone assumptions until needed, I am in favor of exploiting

[16] Curiously, I cannot find in Martin's writings the standard definition of abstraction in terms of definite description (e.g., [Quine (1982), §§44, 48]), such that:

$$\{y \mathfrak{z} \text{—}y\text{—}\} \leftrightarrow \imath z \forall y[y \in z \leftrightarrow (\text{—}y\text{—})] \leftrightarrow \exists w \forall y \forall z[(y \in z \leftrightarrow (\text{—}y\text{—})) \leftrightarrow y = w].$$

the virtual theory for all it is worth." Martin was one of the very few to honor the letter of Quine's call for ontological parsimony.

3.3. **Mereology.** A mereology is a first order theory of the part-whole relation. The word appears only in Martin's late writings, including in the titles of his last two books. But his fascination with the formal part-whole relation spanned his entire career, beginning with his thesis. To my knowledge, that thesis was only the second work written in English to apply mereology in any way, the first being [Woodger (1937)]. When discussing the work of Martin and others, I have taken the liberty of modernizing the notation. Citing [Leonard & Goodman (1940)] and [Tarski (1937)], [43.1] begins with a primitive dyadic relation of "inclusion," which I translate as a primitive dyadic predicate P. Pxy denotes that individual x is "part of" individual y. An axiom (R4) of *Extensionality*, $\forall x(\mathrm{P}xa \rightarrow \mathrm{P}xb) \leftrightarrow \mathrm{P}ab$, assures that P is extensional. Identity is defined (D3) in terms of P: $x = y \leftrightarrow \mathrm{P}xy \wedge \mathrm{P}yx$. The monadic predicate Atx, defined (D5) as an abstract by means of P, comes out true if x is an *atom* (atomic individual; Martin's term was "unit"), i.e., x has no parts other than itself.

Let ϕx be an FOL formula in which x appears free. Let the *fusion*[17] or *sum* (Martin's term was "atomic summation") of all individuals satisfying the formula ϕx be $\sigma x\phi$, where x is now a bound variable. (His notation was ($x1$—x—).) Martin defined fusion contextually via his axioms R5(1) and R5(2). R5(1) asserts that $\sigma x\phi$'s being part of individual y is equivalent to all atoms satisfying ϕ also being part of y. I.e., $\mathrm{P}(\sigma x\phi)y \leftrightarrow \forall x[(\mathrm{At}x \wedge \phi x) \rightarrow \mathrm{P}xy]$. R5(2) asserts that individual y being part of $\sigma x\phi$ is equivalent to all atoms that are part of y also satisfying ϕ. I.e., $\mathrm{P}y\sigma x\phi \leftrightarrow \forall x[(\mathrm{At}x \wedge \mathrm{P}xy) \rightarrow \phi x]$.

Leonard-Goodman named their mereological theory the *calculus of individuals* (CI), because all members of the domain are individuals, i.e., are of one sort. For Martin, Goodman [Goodman (1977)], and other nominalists, sets cannot be individuals. The CI is equivalent to the mereology of [Tarski (1937)]. Martin deviated from Tarski and Leonard-Goodman, in two important ways. First, Martin cast his mereology in terms of virtuals instead of reals. (The 1951 ed. of [Goodman (1977)] effectively followed suit, without citing [43.1].) Second, Martin admitted the existence of a "null" individual N, an immediate consequence of R5(1) and R5(2) if ϕx is $x \neq x$. His definition of N, ($x1x \neq x$), is evidently analogous to his definition of the null virtual

[17]For Martin [Semiotics, p. 52], 'fusion' meant the union of all members of a virtual class. His discussion of atomic summation [Semiotics, §III.B] does not mention virtual classes.

set, $\{x \ni x \neq x\}$. N assures that the domain is closed under mereological product and complementation (both definable in terms of fusion) as well as under fusion. The complement of N is the "universal" individual, W, the sum of all individuals. Tarski and Leonard-Goodman explicitly denied the existence of a null individual. Hence for them the domain is closed under sum but not product, and their mereologies are not models of Boolean algebra. The algebraic structure of Martin's mereology, on the other hand, is that of a complete and atomic Boolean algebra.[18] It is Boolean to the same extent as the virtuals are; both are closed under complementation, sum (union), and product (intersection). Hence I will refer to Martin's mereology as the *Boolean calculus of individuals*, BCI.

Aside from brief mentions in [Truth], mereology then vanished from Martin's writings until his [65.1], after which the BCI remained a steadfast part of his first order theory. His fascination with mereology grew such that his two posthumous books include 13 technical papers thereon. Martin's renewed interest in mereology during the latter part of his career can be seen as part of the post-1960 coming of age of mereology, a development well-surveyed in [Simons (1987), Chap. 2]. For more recent references, see [Casati & Varzi (1999)].

Martin's mature version of the BCI ([Semiotics, 3], [Events, 2]) runs as follows. The background logic is now FOL with identity (FOL=).[19] Martin's axioms, *IndR1–7* in [Semiotics, 3], run as follows:

(1) P partially orders the domain. (*IndR1–3*)
(2) At least one atom is part of every individual. Hence the BCI is *atomistic*. (*IndR6*)

Fusion is again defined contextually, by *IndR4* and *IndR5*, equivalent to:

(3) The domain is closed under fusion.[20]

[18]The BCI is Boolean. *Proof Sketch.* Let $\mathrm{P}xy \Leftrightarrow x \rightarrow y$ and $N \Leftrightarrow \mathbf{F}$, and recall that $\rightarrow$ and $\mathbf{F}$ are expressively adequate. Hence the BCI models the sentential calculus. In turn, that calculus models Boolean algebra, with $(x \rightarrow y) \rightarrow y \Leftrightarrow xy$, $x \rightarrow \mathbf{F} \Leftrightarrow x'$, and $\mathbf{F} \Leftrightarrow 0$. Hence the BCI models Boolean algebra. QED. Let B be a set partially ordered by $\leq$, and let a, b, $\mathrm{N} \in B$. If a is an *atom*, then $a \neq \mathrm{N}$, and $b \leq a$ implies $b = a$ or $b = \mathrm{N}$. A Boolean algebra is *atomic* iff $\forall b \neq \mathrm{N}\ \exists a$ [$a \leq b$ and a atomic]. A Boolean algebra is *complete* iff every subset of B has a least upper bound. Another complete atomic Boolean algebra is the algebra of the subsets of a given set.

[19][Simons (1987), §§2, 3] discusses grounding mereology in free and modal logic.

[20]Let $w = \sigma x \phi$. Then this axiom can be stated as: $\exists x \phi x \rightarrow \exists z, w \forall y [\mathrm{At}y \rightarrow (\mathrm{P}yz \leftrightarrow (\phi w \wedge \mathrm{P}yw)]$ [Simons (1987), 52, AEF5]. AEF5 defines the fusion w in context. The equivalent axiom in [Casati & Varzi (1999), 46] is their P.8.

(4) Nonnull individuals exist. (*IndR7*)

By virtue of (4), no axiom need begin with '$\exists x \phi x \rightarrow$'.

There is a simpler way to skin this cat. The defining characteristics of the BCI are that P is primitive, there are atoms but no sets, and the null individual exists. The system in [Simons (1987), §2.3.3] with the first two of these characteristics is AE, due to Eberle. The axioms of AE are: (1) and (3) above, and Extensionality. Eberle, in effect, dispenses with (2) and (4).[21]

Simpler yet is to recast the BCI as an interpretation of *boundary algebra* [Meguire (2003)]. Let $x'y$, xy, and () interpret, respectively, Pxy, the fusion of x and y, and W. The axioms of boundary algebra are: $()() = ()$ [W is idempotent under fusion], and $(())$ [interpreted as N] can be written and erased at will. These arithmetical axioms imply the following algebraic initials: OI, $xyz = yzx$, so that order is irrelevant to concatenation [fusion commutes, associates]; I1, $(x)x = ()$ [all individuals are part of themselves]; I2, $(xy)x = y'x$ [if the fusion of x and y is part of x, then y is part of x]. From these axioms, Martin's *IndR1–7* can be derived.

The null individual is a mathematical fiction that has proved surprisingly contentious. To my knowledge, Martin was the first to advocate it, doing so as follows:

[21]Simons's [Simons (1987), 46–100] magisterial survey of mereological theory does not include Martin's system, presumably because Simons is averse to the null individual. Eberle defines identity in terms of P as in [43.1], so that his ground logic is FOL instead of FOL=. For him, the usual axiom schema $(x = y) \rightarrow (Fx \leftrightarrow Fy)$ is mereological rather than logical. The CI can be formulated with primitive predicates other than P (pp. 9–100 *passim*), with sets (§2.4) as well as without (§2.3; [Goodman (1977)]), and without atoms (§§1.6, 2.3, 2.4 *passim*). To Tarski we owe two interesting parsimonious axiomatizations, stated using sets. The first is §2.4.2 [Tarski (1956), 25]: P is transitive; given any nonempty set, there exists a unique fusion of its members. Martin knew these axioms, as he cited Carnap's [Carnap (1958), 213] version thereof several times. Tarski's second axiom may be replaced by two axioms, one asserting that the fusion of a nonempty set exists, and the other that the member of a singleton set is identical to its fusion. Doing so yields §2.4.3 [Tarski (1937), 161]. Both axiomatizations are easily made atomistic by adding axiom (2) in the text. In any system, all mention of (real) sets can be eliminated in favor of virtuals in either of two ways. The first simply leaves free all variables appearing to the right of '$\in$'. The second (§2.4.3) replaces any atomic formula of the form '$x \in a$' (where a is quantified) by a monadic predicate (e.g., 'Ax') taken schematically. Hence even quantified variables ranging over sets can be eliminated. [Simons (1987), §1.4, 55] advocates this device, first proposed in the 1951 edition of [Goodman (1977)] and employed systematically by Casati and Varzi [Casati & Varzi (1999)].

> In order to develop an unrestricted Boolean algebra ... it is desirable to admit the existence of a null entity ... We shall retain then the interpretation of this system as a calculus of individuals and also admit the null entity.
>
> Martin [43.1, 3]

For a more forthright advocacy of the null individual, see the opening paragraphs of his [65.1]. [Semiotics, pp. 48–55] gave two additional justifications for a null individual: it eliminates any need for grounding mereology in free logic (the preference of [Simons (1987), §2.5, 361f]), and assures that every description has a *designatum*. The latter reason echoes Carnap who, citing [43.1], advocated the existence of a *null thing* "... characterized as that thing which is part of every thing" [Carnap (1956), 36–7]. Postulating a null thing was one of seven ways Carnap proposed to assure that every definite description has a *designatum*. [Bunt (1985), 56–7], nowhere mentioning Martin or Carnap, wrote:

> *emptiness* ... is defined as the property of having no other parts than itself ... From the transitivity of the part-whole relation it follows that all parts of an empty ensemble [null individual] are empty. ... it can be proved that there exists an empty ensemble, and that an empty ensemble is part of every ensemble [individual].

Commenting on Carnap, Geach, writing in 1949, wrote:

> There is a well-known convention in mathematics whereby 'the least' or 'the only' number fulfilling a condition is deemed to be zero if there is in fact *no* number thus uniquely described. This has technical advantages ... Carnap proposes an allegedly similar convention for language about physical objects [the null thing]. Further, [Carnap] describes the null thing as corresponding 'to the null class of spacetime points'—or, in plain English, as existing nowhen and nowhere! [Geach (1972), 200]

[Simons (1987), 13], citing Geach, summarily dismisses the null individual as follows: "Most mereological theories have no truck with the fiction of a null individual which is part of all individuals ... The chief culprit in propounding this absurdity is R.M. Martin."

D. K. Lewis, expositing a theory quite similar to Bunt's, wrote:

> If we accepted the null individual, no doubt we would identify the null set with it, and so conclude that the null set is part of every class. But it is well nigh unintelligible

> how anything could behave as the null individual is said to behave. It is a very queer thing indeed, and we have no good reason to believe in it. Such streamlining as it offers in formulating mereology [e.g., closure under intersection] can well be done without. Therefore, reject the null individual; look elsewhere for the null set.
>
> [Lewis (1991), 11]

Casati and Varzi take a more measured stance:

> ... few authors have gone so far as to postulate the existence of a 'null individual' that is part of everything. Without such ... (which one could hardly countenance except for algebraic reasons), the existence of an [intersection] is not always guaranteed. Likewise ... complements may not be defined, e.g., relative to the universe.[22]
>
> [Casati & Varzi (1999), 45]

3.4. **Event Logic.** What is it that the virtual sets bring together? And to what material is the BCI to be applied? Martin's ontological preference was clear: *events*. As *propositions* were central for Fitch, *states of affairs* for Chisholm, *physical objects* for Quine, and *qualia* for Goodman, events became central for Martin [Events, p. 218]. And to reason about events, he ([Belief, 9], [Events, 1, 2], [Logic, 7], [Semiotics, 4]) devised an *event logic* (a first order theory, really), building on earlier systems of Whitehead ([Whitehead (1920)], [Whitehead (1925)]), Reichenbach [Reichenbach (1947)], and Carnap [Carnap (1958), §52], and drawing on the virtuals, the CI, and event-descriptive atomic formulae. Martin ([Primordiality, 12], [Metaphysical, p. 230]) even went so far as to propose his event logic as an alternative to Kripke semantics for modal logic.[23]

The exposition below follows [Semiotics, 5A–D], except that I have modernized and otherwise altered the notation somewhat. Begin by adding events to a domain containing nothing but physical objects, so

[22][Casati & Varzi (1999)] cite [Events] once, in a passage with a footnote citing other work by Martin. Martin's name is otherwise absent from their work.

[23][Events], seen through a mereological and topological lens, have been much investigated of late; see Casati and Varzi ([Casati & Varzi (1996)], [Casati & Varzi (1999), Chap. 10]) and references therein. Whitehead ([Whitehead (1920)], [Whitehead (1925)]) was apparently the first to reason in this fashion; for a gentle exposition of his system, see [Kneebone (1963), 341–50]. His system was grounded in a domain of events and a primitive dyadic, transitive, and asymmetric relation K such that Kab comes out true when event b is a *proper part* of event a. K is synonymous with the predicate PP in R5 below.

that variables now range over events as well as objects. The primitive monadic atomic formula Ex [Ox] comes out true when x is indeed an event [object]. An axiom (R7) assures that objects and events are mutually exclusive. The dyadic primitive atomic formula Bxy comes out true when event x precedes event y in time. There are an unspecified number of event-descriptive atomic formulae of the form $\langle\Phi\alpha\rangle e$, where Φ is an event-descriptive predicate, α is a vector of names of objects, and e is the event described by $\Phi\alpha$. The objects named by α are known as *subjects*. Identity of events, variables, vectors of subjects, and predicates are defined in ways that follow naturally from Leibniz's identity of indiscernables. Finally, the BCI applies to events as well as to objects. Hence the fusion of all events is the world event (WE), whose complement is the null event (NE).

Here Martin introduces six axioms. Let Φ and Γ be any two primitive event-descriptive predicates.

R1.: $\Phi\alpha \leftrightarrow \exists e\langle\Phi\alpha\rangle e$. If an event-descriptive formula comes out true, then there exists at least one corresponding event.

R2.: $\langle\Phi\alpha\rangle e \rightarrow [e \neq \alpha_1 \wedge \cdots \wedge e \neq \alpha_n]$. An event is distinct from the α describing it.

R3.: $\langle\Phi\rangle\mathrm{NE}\langle\alpha\rangle e \rightarrow e \neq \mathrm{NE}$. An event-descriptive formula cannot describe the null event.

R4.: $\langle\Phi\rangle\mathrm{NE}\langle\alpha\rangle e \rightarrow \mathrm{E}e$. An event-descriptive formula cannot describe an object.

R5.: $[\Phi \subset \Gamma \wedge \Gamma \not\subset \Phi] \rightarrow [\langle\Phi\alpha\rangle e \rightarrow \exists x\langle\Gamma\alpha\rangle x \wedge \mathrm{PP}ex]$. If the relation Φ is a proper subset (in the virtual sense) of the relation Γ, then for any event $\langle\Phi\alpha\rangle e$, there exists an event $\langle\Gamma\alpha\rangle x$ having $\langle\Phi\alpha\rangle e$ as a proper part. In any mereological context, x is a *proper part* of y iff $\mathrm{P}xy \wedge \neg\mathrm{P}yx$.[24]

R6.: $(\Phi = \bigcap_{i=1,n}\Gamma_i \wedge \forall 1 \leq i,j \leq n\ [\Gamma_i \neq \Gamma_j] \wedge \langle\Phi\alpha\rangle e) \rightarrow \exists x_1,\ldots,x_n[e = \bigcup_{i=1,n} e_i \wedge \forall 1 \leq i,j \leq n\ [e_i \neq e_j] \wedge \langle\Gamma_1\alpha\rangle e_1 \wedge \cdots \wedge \langle\Gamma_n\alpha\rangle e_n]$.

Martin referred to R6 as the *Principle of Decomposition*. In words, if Φ is the product of n relations, each a Γ_i and no two of which are identical, and e is a Φ-event, then e can be decomposed into n nonidentical events, no two of which are identical and each a Γ_i-event. In essence, a logical product of relations corresponds to a logical sum of events.

In R1–R6, Φ, Γ, and each Γ_i must be primitive predicate letters, and cannot be either null nor universal.

[24]Martin's discussion of R5 on p. 63 of [Semiotics] is confusing.

Martin then posits 10 further axioms governing the interrelations among the event logic predicates B, E, and O, the virtuals, and the mereological predicates P and At. B is a dyadic asymmetric relation (R8), whose field consists of events (R14) other than the WE and NE (R13). If Pxy comes out true, then x and y are of the same sort, either objects or events (R15). By R16 [R17], fusions of atomic objects [events] are objects [events].

Now let e_1, e_2 be arbitrary events, and let x range over all nonnull events. Then:

R9.: $\forall x[(\mathrm{P}xe_1 \rightarrow \neg \mathrm{B}e_1e_2) \rightarrow (\mathrm{B}e_2x \rightarrow \mathrm{B}e_1x)]$.
R10.: $\forall x[(\mathrm{P}xe_1 \rightarrow \neg \mathrm{B}xe_2) \rightarrow (\mathrm{B}xe_2 \rightarrow \mathrm{B}xe_1)]$.

Now let x range over all atomic events. Then:

R11.: $\mathrm{B}(x\sigma\text{—}x\text{—})e_1 \leftrightarrow \forall x[(\text{—}x\text{—}) \rightarrow \mathrm{B}e_1x]$.
R12.: $\mathrm{B}e_1(x\sigma\text{—}x\text{—}) \leftrightarrow \forall x[(\text{—}x\text{—}) \rightarrow \mathrm{B}xe_1]$.

While event logic can be limited to the above axioms and concepts, Martin deemed it convenient to introduce two dyadic predicates, TO and TP, defined as follows:

- TOxy, meaning that event x *temporally overlaps* event y, comes out true if, for given nonull x and y, either Bxy and Byx are both false, or one of x or y is the WE;
- TPxy, meaning that event x is a *temporal part* of event y, comes out true if, for given nonnull x and y and all events z, TO$zx \rightarrow$ TOzy.

The nonnull event x is a *moment* if x is a temporal part of all nonull temporal parts of x, in which case Mx comes out true, the monadic predicate M being defined in terms of TO and TP. A moment is not to be confused with an atomic event. Moments exist (R19), and every nonull event has moments as its temporal parts (R18).[25]

[25]Martin cited Carnap's [Carnap (1958), §52] event logic, embedded in Tarski's elegant mereological system described in footnote 19, and consisting of the primitives 'P', 'Tr', and 'Th', the axioms A3–A7, and a single definition, that of 'moment'. Carnap formulated his axioms in terms of 'Tr' and 'Th' where I write 'B' and 'O'. Hence Martin's axioms are a superset of Carnap's: Martin's R8 is Carnap's A3; R9, A5; R10, A6; R18, A7. Carnap's A4 is a more complicated version of R11 and R12. Carnap acknowledged his system to be a variant of Woodger's [Woodger (1937), §3.1], and is much easier to follow than the latter and the one in Woodger's Appendix E, by Tarski.

4. A Sampler of Martin's Philosophy and Applied Logic

> Philosophy may be regarded as the endeavor to characterize in an all-embracing system, in the clearest possible terms and on the basis of the clearest possible logic and without artificial abstraction, every item of human experience, from the loftiest to the lowly, as well as to provide suitable methodological foundations for the humanistic disciplines and for the sciences in their totality. The most adequate terms for this formidable task are those that arise immediately out of the subject-matter at hand, namely suitable nonlogical predicates (many of them pragmatic in nature) that readily lend themselves to being formalized or characterized on the basis of standard logic.
>
> [Whitehead's, p. 99].

Such was the noble goal Martin set for himself in midcareer. I now give a brief overview of Martin's intellectual practice.

4.1. **Language.** I will not linger over Martin's ample and enthusiastic writings ond logico-linguistics (he also used the term *protolinguistics*) because I am not competent to grant these the detailed study they merit, and so will I confine my remarks here to a few superficialities. The applicability of logic to the study (Quine: "regimentation") of language was central to Martin's perspective on logic (e.g., 4 chapters in [Logic], Part B of [Semiotics], 8 chapters in [LL], several chapters in [Events]). [Logic, 1] is an introduction to Martin's thinking about language and its relation to logic and metaphysics. His starting point appears to have been Reichenbach [Reichenbach (1947)], about whom Martin was critical but respectful. The same applies to his attitude re Henry Hiż's work. Martin's admiration for Zellig Harris was much less qualified, and he likewise said kind things in print about the early writings of George Lakoff, Gilbert Harman, and James McCawley. (Martin did not live to see their later writings.) On the other hand, Martin's position with respect to the work of Barbara Partee and Richard Montague was nothing but critical ([Events, 6–8], [Logic, 5, 6], [Semiotics, 8, 9, 15], [Pragmatics, 12, 19], [Metaphysical, 2, 14]). Curiously, Martin said little about Quine's *Word and Object*, notwithstanding its reputation and that of its author. Most striking is Martin's lack of sympathy with the program of Chomsky and his disciples:

> The real defect of the MIT deep structures is that they are not very deep after all, and that the 'theory' governing them is far from being anything of the kind that a logician would be willing to call 'a theory'. Referential consideration ... must be brought in explicitly, as well as various notions from event logic and the theory of intensionality.
>
> [Events, p. 169]

Martin's ample writings on formal linguistics have attracted little attention. Of the 110-odd papers I have found citing Martin's work since 1970, only 13 are in linguistics (see Table 1 below). Moreover, Martin's name appears nowhere in [Gamut (1991)], a treatise on logic and language penned by six Dutch logicians headed by Johann van Benthem, and in Partee and Porter's [Partee & Porter (2002)] anthology on formal semantics. Did Montague's devastating review of [Intension], discussed in §5 below, contribute to this silence? In any event, Martin ([Metaphysical, p. 15]) had planned to write a book, inspired by Zellig Harris's *A Grammar of English on Mathematical Principles* [Harris (1982)], whose working title would be the same but for the substitution of "Logical" for "Mathematical." Regrettably, he did not live to complete it.

4.2. **Semiotics.** From [Truth] onwards, Martin continually invoked the well-known syntax-semantics-pragmatics triad of Morris and Carnap. Inspired by Peirce's concepts of *type* and *token*, he sought to formalize syntax via his notions of "sign-design" or "shape," "sign-event" or "inscription," and "shape descriptive predicates" ([Truth, 2.K, 11, 12], [Semiotics, 5]). In [Semiotics, 6] and [Events, 3], he proposed a formal semantics building on *reference* (the term intentionally echoes the "Bedeutung" of Frege's "Über Sinn und Bedeutung," which Martin translated as "On Sense and Reference") and [Toward]'s notion of *acceptance*. He employed these notions freely when discussing linguistic theory and the foundations of mathematics. By 'reference' Martin meant the following:

> Let 'reference' be construed in the widest sense, in accord with which humans use whatever they take as sign events to refer to the entities of their experience in the cosmos. The notion of reference is usually left rather vague in philosophical discussion, and hence it will be of interest to attempt to formulate a precise theory. If it is asked 'What is it that refers to what?', the answer is that humans take sign events, usually as embedded in

> certain linguistic contexts, to refer to entities on certain occasions. Sign events so used are in effect the words and phrases of [human] language. ... in the theory of reference at least five factors should be recognized: the person, the sign event, the entity, the linguistic context, and the occasion of use.
>
> [Semiotics, 6, first paragraph]

The similarity to the position of by [Morris (1955)] should be clear.

By giving the title "Semiotics" to what proved to be the final complete exposé of his logic, namely Part A of [Semiotics], Martin revealed by implication that he had come to accept Peirce's view that logic is but a branch of semiotics. Later, he [Metaphysical, 1] recast the core of Peirce's semiotics in formal terms, maintaining (and rightly, in my view) that no progress had been made on this score since Peirce's purely verbal statement of his semiotics.

4.3. **Nominalist Foundation for Mathematics.** Martin saw the provinces of logic and mathematics as quite distinct [Belief, 1]. Nevertheless, he was quite willing to extend the compass of his nominalism from philosophy to mathematics. Nominalism is an ontological stance that asserts that the universe of discourse shall only consist of individuals. Moreover, there can be "no distinction of entities without distinction of content" [Goodman (1972), 161]. No two distinct things can be composed of the same individuals. Letting a and b be name letters designating two individuals, a nominalist would refuse to distinguish $\{a, b\}$, $\{\{a\}, \{a, b\}\}$, and $\{\{b\}, \{a, b\}\}$. Thus nominalism rules out the Kuratowski ordered pair. Nominalism likewise rules out constructing the ordinals from iterations of the empty set. As a consequence, a nominalist cannot accept most of standard foundational mathematics.

In their detailed survey of nominalist approaches to mathematics, Burgess and Rosen [Burgess & Rosen (1997)] argue that the approach begins with Quine and Goodman [Goodman & Quine (1947)]. I submit that it began with Martin's Ph.D. thesis and his [43.1], neither of which Burgess and Rosen cite. From his Ph.D. thesis to the Appendix of [Logical], Martin sketched ways of deriving numbers, geometry, analysis, etc. from the extended first order logic he advocated, a nominalist and extensionalist ontology, and constructive methods, making free use of virtual sets and relations. (Also see his [49.2], [50.1], [Whitehead's, 6, 7], [Events, 4, 12, 15], [Pragmatics, 20], [Primordiality, 20], [Metaphysical, 11, 12, 17].) He echoed [Metaphysical, p. 177] Meyer and Routley's [Meyer & Routley (1977), 365] name for the methodological strictures of nominalism, "the heroic course."

In [Events, 4] and [Semiotics, 7], Martin purported to derive the Peano axioms from his pragmatics and theory of reference, augmented with a sort of axiom of infinity. In [Peirce's, 12], he showed how the ZF axioms of set theory could be recast in 'Scotistic' terms, starting from mereology and a primitive dyadic relation he called 'subsumption', indistinguishable from inclusion, and with the notion of 'common nature' replacing 'set'. Late in his career, he ([Peirce's, 13], [Primordiality, 6, 17, 20]) on occasion relented in his antagonism to set theory, invoking it for the sake of argument. He ended an essay on Royce with the following curious pragmatic interpretation of set theory:

> Acts of classifying are mental acts and set theory ... becomes a branch of the wider theory of such acts. The view is thus compatible with metaphysical idealism, if individuals or *Urelemente* are taken as manifestations of mind. This would not seem to hold of other renditions of set theory, for which an objective realm of sets as "abstract objects" *sui generis* is needed.
>
> [Peirce's, p. 154]

With his [83.2], Martin's nominalist foundation for mathematics took a new tack, which he expanded in [Metaphysical, 12]. As always, Martin begins with first order logic augmented by the virtuals and mereology, but the latter is no longer the BCI, but the ordinal mereology of his final years, which adds to the mereological primitive P a primitive binary ordination predicate, Ord, that combines two individuals into an *ordinal individual*. The essential fact about Ord is that the order of its arguments matter, so that given individuals a and b, $\mathrm{Ord}(a, b) \neq \mathrm{Ord}(b, a)$. The ordinal individual functions like an ordered pair in that it serves as the foundation for relation theory. It is not obvious just how the ordinal individual steers clear of Goodman's dictum "no distinction of entities without distinction of content," when the Kuratowski definition of the ordered pair clearly does not do so. While Martin read Eberle's [Eberle (1970), §2.10] detailed discussion of relational individuals,[26] the similarity, if any, between ordinal and relational individuals remains to be explored. In any event, [Metaphysical] did not cite Eberle, and Martin in effect sidestepped much of set theory by simply taking the ordered pair as primitive.[27]

[26]Martin communicated this to Rolf Eberle, who relayed the fact to me in a personal communication dated 9.25.04.

[27]Von Neumann and Bourbaki [Kneebone (1963), 294, 302] took the ordered pair as primitive, as have some present-day foundational mathematicians, e.g. [Holmes (1998), 26, 55].

Martin then sets out axioms and 80-odd definitions, covering the ground from first order logic through the addition and multiplication of complex numbers. Virtual sets have the expected Boolean properties, and P is a partial order. *Cardinal*, and *unit individuals* (henceforth I omit *individual*) are defined in terms of Ord and P: a cardinal is part of the fusion of all nonordinals; a unit is a nonnull part of all its nonnull parts. Identity of ordinals works as it should. There are three axioms governing the interplay of Ord and P, and axioms assuring the existence of at least one individual that is both unit and cardinal, and of a successor cardinal to each cardinal. Relational individuals of all adicities, virtual relations with familiar definitions and basic properties (domain, one-to-one, etc.), the successor and ancestral of a cardinal individual, equinumerosity, the cardinal (counting) numbers, definite numerical descriptions, and the numbers: signed, rationals, reals, and complex, all with their respective operations, are then forthcoming by definition.

Martin lays out more axioms, 28 in all, but then changes course, proposing that certain of his axioms be recast as contextual definitions of fusion. He then concludes that given such definitions, a mere two additional axioms suffice for mathematics:

- *PrA*: $\forall x, y\, \exists z\, [\mathrm{PW}x \vee \mathrm{PW}y \vee z = \mathrm{Ord}(x, y)]$. Given any two individuals, neither being the world individual W, there exists an ordinal individual combining them;
- *PrC*: $\exists z \forall x [\mathrm{Unit}x \rightarrow (\mathrm{P}xz \leftrightarrow \phi)]$. The fusion of all units satisfying the FOL formula ϕ exists. This is a standard theorem in all extensional mereologies.

The terseness of this exercise is exhilarating, to say the least, and with nary a real set or relation in sight.[28] It is to be regretted that Martin

[28]To appreciate the terseness of Martin's treatment, I now set out what other approaches require beyond FOL in order to define the product of two naturals and two reals. For a contemporary derivation of the numbers, natural to complex, see [Little & *al.* (2003)]. Starting from standard set theory, they assume the existence of the empty set and of an inductive set based thereon, and define the naturals as the unique inductive set included in every inductive set (Thm. 3.1). Defining the product of naturals requires 32 theorems and lemmas; that of reals, yet another 45 theorems. The Peano axioms are nowhere mentioned. Turning to historical approaches, Martin's concision parallels Whitehead's [Whitehead (1934)], for whom the product of naturals requires merely 31 definitions and 13 axioms. However, other historical treatments are far more involved. [Suppes (1960), Def. 10 on p. 115]: 72 definitions, 7 ZF set theory axioms, and 266 theorems. The product of reals appears 67 pp. later, as Def. 6.52. [Quine (1951), D47 on p. 259]: 39 definitions, three set theoretic axioms, and 336 theorems, filling 145 pp. The product of reals is defined on p. 277. [Quine (1969), 16.2 on p. 107]): 4 set theoretic axioms, 31

did not write a treatise, analogous to [Quine (1969)], laying out in systematic fullness his reasoning about the foundations of mathematics.

4.4. **Aesthetics.** Martin sketched formal theories, grounded in logic as always, of music ([70.1], [Primordiality, 14]) and the visual arts ([81.1], [Primordiality, 15]), the latter building on Goodman ([Goodman (1968)], [Goodman (1978)]). [Goodman (1981)] took exception to [81.1]; [Mind, 14] was Martin's reply. Silber's [Silber (1986)] obituary notice stated that Martin was an accomplished pianist, and that he and his spouse were serious art collectors.

4.5. **Science.** Late in his career, Martin wrote some papers about the philosophy of science. He [Logic, 8] tried his hand at the metaphysics of space-time, following in the footsteps of Carnap and Reichenbach. Martin wrote on the philosophical physics of Lazlo Tisza, Joseph Sneed, and John Wheeler ([Primordiality, 21], [LL, 12], [Logical, 17,20]). In an essay on Scriven and Suppes [Primordiality, 15], he touched on causality and probability. [Mind, 15] discussed Eccles and the mind-body problem. In [Logical, 19], he mulled over Wigner's awe at the "remarkable effectiveness" of mathematics in physics.

4.6. **Metaphysics.** Martin wrote a good deal under this heading, with enthusiasm. Setting aside Whitehead, to whom I will return below, Martin wrote on Findlay, Hartshorne, Hintikka, Veatch [Primordiality, 8, 9, 12, 20, 11], Fitch [Whitehead's, 7], and Strawson [Mind, 7]. Martin adopted Quine's notion of ontological (he preferred ontic) commitment. In his [52.1] and in [Notion], Martin dissented from Quine's and Morton White's dismissal of the analytic-synthetic distinction, a dissent [Carnap (1956), 223] cited with approval. Martin's position prompted Quine to add a paragraph to each of the chapters "Two Dogmas" and "Theory of Reference" in [Quine (1980), 35, 138], paragraphs not included in the earlier journal version of those essays. Martin's practice of philosophy, his metaphysics and theology aside, warrants comparison with that of Russell and Carnap. Russell, however, wrote little in the way of technical philosophy after the outbreak of WWI, and Carnap shared the aversion of the *Wiener Kreis* to most matters metaphysical.

Martin's logico-mathematical approach to metaphysics and cosmology has a very distinguished precedent: Whitehead. By insisting that metaphysical reasoning be firmly grounded in formal logic, Martin

definitions, and 107 theorems. The product of reals is defined on p. 137. *Principia Mathematica*: Vol. II, p. 101, *113.02, 548 pp. after the end of the exposition of FOL on p. 186 of Vol. I. The product of reals is not defined until Vol. III, p. 333.

([Logic, 1, 7, 8], [Events, 2], [Mind, 5]) agreed with the Whitehead who wrote:

> Speculative Philosophy is the endeavor to frame a coherent, logical, necessary system of general ideas in terms of which every element in our experience can be interpreted. ... It will be observed that logical notions must themselves find their places in the scheme of philosophic notions.
>
> [Whitehead (1978), 3], cited in [Events, p. 39]

Whitehead's name appears in the name index of most of Martin's books, starting with 8 entries in the index to [Truth]. The comparable numbers for [Primordiality] and [Metaphysical] are 30 and 23. ([Whitehead's] and [Logical] mention Whitehead repeatedly but are not indexed.) Martin drew on his event logic to formalize the process philosophy of Whitehead and Hartshorne, and to elucidate difficult passages in Process and Reality and Science and the Modern World ([Whitehead's, 1, 4, 5], [Mind, 12]), going well beyond Whitehead's principle of extensive abstraction.[29] Finally, Martin was personally devoted to Whitehead: "It was my good fortune to have been a direct student of Whitehead's during his very last year of teaching." ([Logical, p. 200]). He dedicated [Truth] to Whitehead "my teacher and friend."[30]

Historical figures other than Whitehead whose work Martin formalized include Plotinus ([82.1] and [Primordiality, 6, 7]) and Husserl's *Logical Investigations* ([Metaphysical, 18] and [Logical, 14]). Martin also wrote extensively on Frege ([63.1], [67.2], [72.1], [76.1], [Belief, 10], [Logic, 2], [Pragmatics, 16], [Peirce's, 7]) and Peirce ([Peirce's, 1, 2, 4, 5, 6, 8, 10], [Primordiality, 16, 18, 19]), notwithstanding the marked difference between the two.[31] Other historical figures he touched on include De Morgan, Bradley [Peirce's, 3, 9], Kant, Schlick [Primordiality, 16, 20], and Russell [79.1].

Near the end of his life, commenting on Putnam's belief that metaphysics was "no longer a culturally and humanly significant enterprise [and its] successful revival ... seems overwhelmingly unlikely" [Putnam (1982), 164], Martin wrote:

[29]For a gentle introduction to the principle of extensive abstraction and to Whitehead's mathematical metaphysics more generally, see [Kneebone (1963), 341–53].

[30][Power (1975)] discusses Martin's contributions to process philosophy and theology.

[31]The Fisch–Martin correspondence at the Peirce Edition Project reveals that Martin applied more than once, without success, for a grant to write a monograph on Peirce's logic, unjustly neglected at the time. On that logic, see [Brady (2000), Chaps. 1–6].

> ... as Etienne Gilson has skillfully pointed out, metaphysics throughout its long career has always lived on to bury its undertakers. The question of 'revival' is not now in order so much as on of proper formulation and development in modern terms. Metaphysical theory formulation may well be man's highest enterprise ... but we serve it ill if we fail to avail ourselves of the most advanced and sophisticated metalogical techniques now available.
>
> [Metaphysical, p. 278]

5. Martin's Fate

The secondary literature on Martin is miniscule, consisting of two articles, two book reviews of article length, two notes, three comments published as part of symposia, and six replies to comments he made on the work of others. Martin cited a paper by John Findlay that has not, to my knowledge, ever been published; I have added it to the bibliography. Table 1 contains my informal breakdown, by subject, of the articles citing Martin turned up by the Web of Science. I conclude that Martin is very occasionally cited in the contemporary literatures on philosophical logic, especially the logic of C. S. Peirce, nominalism, semiotics, formal semantics and pragmatics, formal theories of events, process theology, process theology, and the philosophy of religion.

Table 1 includes an entry for phenomenology to show that that literature has yet to take any notice of Martin's formalization of some passages by Husserl. Martin wrote on Husserl at a time when perhaps the only other analytic philosopher to do so was Dagfinn Følesdall.

Why has most of Martin's ample and multifaceted work met with so much indifference during the past quarter century or so? A turgid style is not at fault; his writings are usually clear and chatty, easier to follow in my opinion than Quine's or Carnap's (but not as clear as Goodman's or Ryle's). As stated above, Martin favored approach to formal systems was a dated one, namely axiomatic first order theories. His preferred approach to formal semantics was unconventional, grounded as it was in a nominalist aversion to set and model theory.

The first order theory that underpinned so much of Martin's formal work never acquired a following. Although Quine employed a virtual set theory effectively identical to Martin's, the virtuals have yet to

[32]Citations do not sum to 114 (cf. Table 2), because some articles are counted more than once.

Area	No. of Citations
Logic	29
Linguistics	13
Math, Comp. Science	6
Metaphysics	3
Nominalism	5
Peirce	14
Phenomenology	0
Process	7
Religion	14
Semiotics	4
Other	35

TABLE 1. Subject Areas of Articles Citing Martin, 1970 to present.[32]

catch on. Mereology has come up in the world, but mereologists shudder at the common-garden Boolean structure Martin favored for the part-whole relation. As for event logic generally, the *locus classicus* is Donald Davidson's "The Logical Form of Action Sentences," to which [69.1] took exception. Davidson replied as follows:

> ... by Martin's account, no meeting is identical with an encounter, though between the same individuals and the same time ... No stabbing can be a killing, and no killing can be a murder, no arm-raising a signaling, and no birthday party a celebration. I protest
>
> [Davidson (1969), 81]

On the other hand, in their introduction to an anthology devoted to the logic and ontology of events, Casati and Varzi [Casati & Varzi (1996), *xix*] conclude that [69.1] has affinities to related work by Jaegwon Kim, Alvin Goldman, and Lawrence Lombard.[33] Nevertheless, the literature on event logic almost never cites Martin. [Casati & Varzi (1996)] did not reprint anything by Martin, and the only work of Martin's cited therein was his [69.1], cited once in an article by Lombard.

[33]References may be found in [Casati & Varzi (1996), *v–vi*, *xxxiii–xxxviii*].

More pointedly, Martin's work did not find favor with his peers, beginning with A. R. Anderson [Anderson (1962)] of relevance logic fame, who took [62.1] to task for its radical nominalist definition of what constitutes the extensional. Anderson maintained that any intensional entities with an operative identity criterion could be treated extensionally. [Goodman (1963)] and [Jobe (1963)] critiqued [Toward], the former taking firm exception to its reduction of the projectibility relation in [Goodman (1955)] to acceptance alone. [Intension] led to more spilled ink than anything else Martin wrote, namely four reviews and a comment totaling 22 pages, half of which appeared in the *Journal of Philosophy*. Kyburg's review was favorable, and no less than Paul Benacerraf began his [Benacerraf (1965)] with a long quote from [Intension]. But the other reviews and the comment were critical, Montague's especially so, all taking strong exception to [Intension]'s theory of intensions and pointing out many technical lapses and confused notions. Martin disavowed this theory of intension in his [67.1] and [Belief, 7], neither citing [Intension] nor mentioning its contents ever again. Did [Intension]'s unfavorable reception lead nearly all logicians and most philosophers to ignore Martin's work thereafter? Did the fact that the most critical review was penned by someone of Montague's standing lead many to doubt Martin's competence as a logician?

Of the 11 books Martin published after [Intension], six were published in Europe. These 11 books garnered 26 reviews, only six of which were in American journals other than the *Review of Metaphysics*. Moreover, many of these 26 reviews were critical. This is easiest to see from the chapters he devoted to responding to a number of reviews to which he took strong exception ([Mind, 14, 18], [LL, 6], [Metaphysical, 14,19], [Logical, 2,11]). These responses reveal that philosophers of the stature of Frederick Fitch, Jeff Foss, Nelson Goodman, Henry Hiż, Rita Nolan, Putnam, LaVerne Shelton, and Patrick Suppes, all did not look upon his work with favor. [Semiotics], for example, was reviewed four times, but only once favorably, by Haack; she praised its ontological parsimony. The best of these later reviews, the long and thorough ones by [Bacon (1972)], of [Belief], and by [Cocchiarella (1981)], of [Pragmatics], were likewise highly critical. I can only conclude that Martin's work was often dismissed as wrong-headed, and invite others to decide whether those criticisms were well-taken.[34] Between 1943 and

[34]More than once, Martin expressed sharp annoyance in print about logicians active in California, to wit: "A high merit of much of [Benson] Mates's work is that it is not a product of the California logic mafia" [Metaphysical, p. 208]. I have no reason to doubt Martin's respect for Mates. I submit that the intended object of Martin's acid sarcasm was Richard Montague, Tarski's brilliant student who taught

1964, *The Journal of Symbolic Logic* reviewed 25 articles by Martin; after 1964, only four articles by him were so honored.

Source	*Martin*	*Sellars*	*Type of Data*
	1943–1992	1947–1992	Years published
Philosopher's Index (1940–present)	83 items	68 items	Publications
This article	16 books written 3 books edited 124 articles 14 book reviews	n.a.	”
Web of Science (1970–present)	21 articles 6 book reviews	15 articles 1 book	”
”	Books: ∼100 Articles: 114†	1689†	Citations

TABLE 2. Martin and Wilfrid Sellars Compared. †Includes self-citations and book reviews.

Citation counts may be more revealing of the fall from grace I conjecture. The Web of Science, which counts citations in the peer-reviewed literature, turned up 114 citations since 1970 of Martin's articles, edited books, and chapters in books edited by others. This number does not exclude self-citations, a material problem as, from 1970 onwards, Martin published 32 articles and 7 book reviews. Turning to his books, I excluded the many self-citations and any citation of a book made in a review of the selfsame book. While the Web of Science turns up about 100 citations for the 16 books he authored, the last 10 of these, starting with [Whitehead's], have been cited only 27 times as of this writing, with [Peirce's] and [Primordiality] having never been cited at all. Many,

at UCLA and who was long dead by the time Martin wrote. Cocchiarella was his student. Montague's review of [Truth], while favorable overall, pointed out many errors and lapses. But his review of [Intension] was nothing but scathing. Later, Martin [75.2] wrote an entire paper taking exception to Montague's approach to logico-linguistics, the eponymous grammar in particular. But in no way were critics of Martin's books necessarily educated or employed in California. John Bacon learned logic at Yale about 25 years after Martin did. The author of [Jones (1974)], a critical joint review of [Belief] and [Logic], was British. To my knowledge, Martin never replied to Bacon, Cocchiarella, or Jones in print.

if not most of those 27 citations are in Martin's reviews of books by others, and in just two articles, [Power (1975)] and [Clarke (1978)].

I now contrast these citation counts for Martin with the comparable numbers for Wilfrid Sellars (1912–1989), a contemporary of Martin's with a rare surname facilitating databases searches. The results are in Table 2. According to the Philosopher's Index, which begins in 1940, Sellars [Martin] published 68 [83] items. Netting out the 19 books Martin wrote or edited leaves 64 articles; the bibliography at the end of this paper includes 124 articles and 14 book reviews. Sellars was cited 1689 times over the period covered by the Web of Science. That this count includes some self-citations and book reviews should be immaterial, as over the period in question, Sellars published only 15 articles and one monograph.

Martin looked and smelled like a logical positivist, while violating a number of tacit expectations of that faith. Mainstream philosophers presumably did not care for Martin's ardent nominalism and Carnapian semantics. Nelson Goodman, a fellow archnominalist, never cited Martin's work on nominalism, mentioning Martin in his writings only to criticize other aspects of his work. Moreover, Martin did not genuflect before mainstream reputations, e.g., Davidson, Popper, Sellars, Suppes. Martin was curiously aloof about Wittgenstein, whom he discussed only once at any length [Belief, 8], otherwise mentioning him only a handful of times. He frequently invoked the word "semiotics" and the semiotic triad, yet took little interest in the work of Charles Morris and never mentioned the work of his semiotician contemporaries, e.g., Eco, Savan, or Sebeok.

These facts out of the way, I now beg the reader's indulgence as I retreat to the realm of raw conjecture. Were mathematicians put off by his nominalism, his consequent distaste for set theory, and the unPlatonic foundations he proposed for numbers and geometry? Did philosophers of mathematics look askance at these stances, as well as at his combative exchanges with Putnam? Were philosophical logicians put off by his disdain for nonclassical logic and baffled by his fascination with the virtuals and mereology? Mathematical logicians could not respect someone who proved no metatheorems, despised set and model theory, and doubted the philosophical importance of self-reference in general, and Gödel's work in particular. Logico-linguists were surely put off by his dismissal of the MIT school and, perhaps, by his disagreements with Hiż and his reverence for Zellig Harris, a notorious lone wolf. Did metaphysicians typically deem Martin too fascinated with logic and mathematics, and too prone to grant ontological primacy to events?

Existentialists would have deemed Martin a positivist philistine. Meanwhile, positivists and Humean skeptics were embarrassed by his sympathy for the Christian tradition. Theologians would find him too technical; Protestants, too Catholic; Catholics, too Whiteheadian. Now the intersection of the set of analytic philosophers and the set of Christian sympathizers is not a singleton; it included Peter Geach. Yet in that quarter lay no friend or ally, as Martin took Geach to task in his [49.1], then ignoring him until last book.

In short, I submit that Martin was the direct contrary of being 'all things to all men,' instead managing to put off nearly all of his academic contemporaries. And who was possibly left after all these hypothetical academic gaffes? Why, the disciples of Whitehead and Peirce. And 14 papers devoted to aspects of Peirce's work and published since 1970 indeed do cite Martin. Yet [Peirce's], which collects a number of his papers on Peirce, has never been cited and is the only book of Martin's never reviewed. [Power (1975)] and [Clarke (1978)] are the only full length papers (prior to this one) on Martin's work, and their authors are Whiteheadian theists. Elsewhere, they cite Martin in six other papers. I decline to speculate as to why other American Whiteheadians undaunted by logic, e.g., Fitch, Hartshorne, did not do more to sing Martin's praises. And what did Fred Sommers think of Martin?

Two years before his death, Leibniz wrote:

> ... if I had been less distracted or if I were younger ..., I should still hope to create a kind of *universal symbolistic* [*spécieuse génerale*] in which all truths of reason would be reduced to a kind of calculus. At the same time this could be a kind of universal language or writing ... the characters and the words themselves would give directions to reason and the errors—except those of fact—would be only mistakes of calculation. It would be very difficult to invent this [symbolistic], but very easy to learn it without any dictionaries.
>
> [Leibniz (1969), 654][35]

The predicate-rich first order theory Martin devised for doing philosophy was, I submit, a realization of the "universal symbolistic" (which Leibniz usually called characteristica universalis) Leibniz called for throughout his life. In his contribution to a collection of essays honoring the centennial of Whitehead's birth, Martin's mentor Fitch wrote:

[35]Letter to Nicolas Remond, dated 10.1.1714, quoted in [Kneebone (1963), 151–52].

> I believe that logic will eventually make possible new advances in value theory, epistemology, and philosophy which will be comparable with the advances that traditional mathematics, especially after the advent of calculus, has made possible in the natural sciences ... the study of logical systems is leading more and more philosophers to view the world in terms of relations, attributes, classes, and propositions, and to study the structure of the world in terms of these categories, for these are the categories that modern logic is most concerned with.
>
> [Fitch (1961), 94–95]

In an essay written in 1941 and titled "Mathematics and the Good" (a title Martin borrowed for [Whitehead's, 7]), Whitehead stated:

> The notion of the importance of pattern is as old as civilization. Every art is founded on the study of pattern. Also the cohesion of social systems depends on the maintenance of patterns of behaviour; and advances in civilization depend on the fortunate modification of such behaviour patterns. Thus the infusion of pattern into natural occurrences, and the stability [and] modification of such patterns, is the necessary condition for the realization of the Good.
>
> Mathematics is the most powerful technique for the understanding of pattern, and for the analysis of the relationship of patterns. [...] If civilization continues to advance, in the next two thousand years the overwhelming novelty in human thought will be the dominance of mathematical understanding.
>
> [Whitehead (1948), 83–84]

Condensed versions of the Fitch and Whitehead passages can be found on p. 100 of [Whitehead's]. Martin wrote the following immediately after the latter quote:

> By 'pattern' here is not meant a Platonic archetype or paradigm but rather a complex structure of relations among entities as characterized with a suitable logical system, with its nonlogical relations, classes, and so on.
>
> [Whitehead's, p. 100]

In 1937, Whitehead wrote:

> We must end with my first love—Symbolic Logic. When in the distant future the subject has expanded, so as to

> examine patterns depending on connections other than those of space, quantity, and number—when this expansion has occurred, I suggest that Symbolic Logic, that is to say, the symbolic examination of pattern with the use of real [i.e., quantified] variables, will become the foundation of aesthetics. From that stage, it will proceed to conquer ethics and theology.
>
> [Whitehead (1948), 99]

Martin quoted this famous passage at the end of [Logic, 1], adding "That stage has not yet been reached, but we have come a long way." I can only concur; Richard Martin's fluvial writings moved a modernized version of Leibniz's dream closer to fruition, and likewise brought the prophecies of Fitch and Whitehead closer to fulfillment.

Abbreviations

APA	American Philosophical Association
JP	*Journal of Philosophy*
JSL	*Journal of Symbolic Logic*
LL	*Logico-Linguistic Papers*
PPR	*Philosophy and Phenomenological Research*
PR	*Philosophical Review*
PS	*Philosophical Studies*
PSc	*Philosophy of Science*
RM	*The Review of Metaphysics*
TCPS	*Transactions of the C. S. Peirce Society*

Books by R. M. Martin

Listed in order of publication, followed by reviews of each. A book is cited in the text by the bolded word in its title.

Cites:	Citations reported by Web of Science of 6/2004, not including self-citations and book reviews.
'*'	In print, as of this writing.

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[Peirce's] ***Peirce's** Logic of Relations and Other Studies* (Boston Studies in the Philosophy of Science) (1979). John Benjamins.
Chaps: 13
Cites: 0

[Primordiality] ***Primordiality**, Science, and Value* (1980). State University of New York Press. Chaps: 20
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Department of Economics, University of Canterbury, New Zealand
E-mail address: Philip.meguire@canterbury.ac.nz