

## **Willard Van Orman Quine's Philosophical Development in the 1930s and 1940s**

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### *1. History of Analytic Philosophy and Early Quine's Place Within It*

W.V. Quine (1908-2000), pioneer of mathematical logic, champion of naturalism in philosophy of science and epistemology, atheist, materialist, unifier of an austere physicalism with the truth of logic and mathematics, globetrotter, polyglot, Harvard stalwart and celebrated naval officer, was both an establishment figure and a free-thinking radical. Quine's life began shortly after the emergence of analytic philosophy. He was soon to become one of its towering figures. Taught by A.N. Whitehead, interlocutor to Rudolf Carnap, Alfred Tarski, and Ruth Barcan Marcus, teacher of Donald Davidson and David Lewis, Quine was at the scene of the development of modern set theory, logical positivism, modal logic, truth-conditional semantics, and the metaphysics of possible worlds. Hardly a significant new movement in analytic philosophy passed him by. Yet Quine's relationship to many of these movements is surprisingly ill-understood. Everyone knows that the logical positivists, including Quine's mentor Carnap, sought to place truth and meaning on a proper scientific footing by countenancing only *a priori* analytic and *a posteriori* empirically testable statements as properly significant. Quine, initially a devoted Carnap acolyte, soon developed reservations about the dichotomy between analytic truth by definition and empirically testable synthetic truth. All scientific truths, he famously argued in 'Two Dogmas of Empiricism' (Quine 1951), rely upon both at once, and both are revisable under sufficient theoretical pressure. Quine's rejection of the analytic-synthetic distinction was once viewed as revolutionising philosophy of science and logic. But, strangely, these days Quine himself is commonly portrayed as a flat-footed positivist, a deflationist, a behaviourist, an anti-metaphysician, whose objections to modal logic turn on superficial scope errors.<sup>1</sup> He has been a victim of his own success, his smooth prose distilled into catchy slogans – 'the web of belief', 'the myth of the museum', 'to be is to be the value of a variable', 'no entity without identity', 'gavagai!' – liable to be misunderstood out of context. A highly original thinker who set himself against common analytic ways of speaking and thinking, Quine is easily misread because his oeuvre is vast, systematic, and largely unconstrained by many of the conceptual categories laid down by other analytic philosophers. To remedy misconceptions about him caused by out of context readings of his work, we must consider Quine's writings and influences from a historical point of view, extending the boundaries of the history of analytic philosophy to include the mid to late decades of the 20th century.

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For such portrayals of Quine, see for instance Price 2009, p. 325-326, Shaffer 2009, pp. 348-361, Tahko 2011, p. 28. For rebuttals of these, see Janssen-Lauret 2015, pp. 151-154 and Janssen-Lauret 2017, pp. 250-255.

Most research on analytic philosophy to date has concentrated on the early period, nearly all of it centred around Frege, Russell, and Wittgenstein, occasionally including Carnap and the Vienna Circle. Recently some historians have ventured into scholarly work on Quine, especially on the early evolution of his position on analyticity (e.g. Creath 1990, Ben-Menahem 2005, Mancosu 2005, Hylton 2007, Ebbs 2011). Quine's previously unpublished lectures and records of his conversations with Tarski and Carnap, revealing the development of his views in the forties, have begun to come out posthumously (Zimmerman 2008, D. Quine and Føllesdal (eds.) 2008, Frost-Arnold 2013). But one significant text has remained entirely unexplored. No one to date has paid any heed to Quine's fourth book on logic and its philosophy, a book written with great urgency as he prepared to bid farewell to logic and philosophy whilst readying himself for war in 1942, a book which he presented in a letter to Carnap as a major turning point (Quine 1990, p. 299).

How did it come about that none of those meticulous Quine scholars have cited, or even read, this book? Because Quine wrote it in Portuguese, under the title *O Sentido da Nova Lógica*, during a visiting professorship at the University of São Paulo. Anglophone philosophers have so far neglected it because they could not read it. An English translation never appeared, apart from a few sections translated by Quine himself, published in the *Journal of Philosophy* in 1943 as 'Notes on Existence and Necessity'. Although generations of Brazilian logicians grew up with *O Sentido da Nova Lógica* (da Costa 1997, p. 688), and Mario Bunge translated the book into Spanish (Quine 1958), Quine modestly declined to translate it into English, claiming that the insights it contained had been supplanted by later, better worked out versions (Quine 1997, p. 8). For contemporary philosophers and historians of analytic philosophy, by contrast, such gradual shifts and their contribution to the development of Quine's mature views are part of the fascination the book holds. A full English translation of it is now finally seeing the light of day. Walter Carnielli, William Pickering, and I have jointly translated the book, which appears in this volume under the title *The Significance of the New Logic*. In this accompanying paper I will draw out the main philosophical contributions Quine made in the book, placing them in their historical context and relating them to Quine's overall philosophical development during the period.

The 1930s and '40s were a time of great intellectual upheaval in the field of logic and its philosophy. What Quine calls 'the new logic' in the title of this book – modern mathematical logic rather than the old Aristotelian paradigm – was gaining momentum throughout Europe and the United States, being put to use in a variety of different ways by analytic philosophers, mathematical logicians, pragmatists, logical positivists, and the Polish School in their attempts to make sense of contemporary developments in science and mathematics. Among the applications Quine mentions in the Introduction to this book are transfinite mathematics, the logicist project, the incompleteness of arithmetic, proof theory, solutions to the set-theoretic and semantic paradoxes, formal theories of truth, and new approaches to ontology. Quine had come to Brazil to introduce these methods and their applications to philosophers and scientists there, for whom this was entirely new territory.

Though written as a logic textbook, *The Significance of the New Logic* also contains intriguing philosophical material. It is known, for example, for the first appearances of Quine's doctrine of pure vs. impure designation – including his famous example of the impurely designative occurrence of 'Giorgione' in 'Giorgione is so-called because of his size' – which he excerpted for 'Notes on Existence and Necessity', and of the virtual theory of classes, to which he was later to give a key role in *Philosophy of Logic* (Quine 1970) and *Set Theory and Its Logic* (1963). Much of the emerging historical literature on Quine concentrates on the evolution of the young Quine's semantic holism, his opposition to the analytic-synthetic distinction, and his philosophical relationship with Carnap. Several careful historical-philosophical works chart Quine's development from his earliest worries about analyticity in the 1930s, via the influence of Tarski in the '40s, to his mature 'Two Dogmas' view of 1951 (Creath 1990a, Hylton 2001, Ben-Menahem 2005, Mancosu 2008, Frost-Arnold 2011). Analyticity and Quine's rejection of conventionalism about meaning are among the key themes discussed in this book. Quine clearly considered *The Significance of the New Logic's* sections on meaning and analyticity to be of consequence, since he selected them for publication in 'Notes on Existence and Necessity'. The ideas expressed in them also led to an intense exchange of letters between him and Carnap on their semantic differences over the course of 1943 (Creath 1990a, pp. 295-377).

But, I will argue, this book is driven just as much by philosophy of logic and ontology. These too were major motivating factors for the early Quine, though they have thus far not received as much attention in the historical literature. Much of the content of *The Significance of the New Logic* is best understood by considering Quine as part of a broader historical narrative, which I lay out in section 2; a précis of the main philosophical moves of the book follows in section 3. Quine is presented as an interlocutor not only to Carnap but also to Tarski, to Frege, to Quine's PhD supervisor Whitehead, and to Whitehead's co-author Russell. Their three-volume magnum opus *Principia Mathematica*, inspired by Frege's new mathematical logic and his logicist thesis that mathematics was reducible to logic, had been the subject of Quine's 1932 PhD thesis and of his first book based on that thesis (Quine 1934). He began to appreciate Frege, whose work was difficult to get hold of in the US at the time, a few years later. Unlike Carnap, these early analytic philosophers held that in addition to epistemology and the analysis of language, metaphysical questions about existence and the nature of things were central to philosophy, too. The early Quine, I show, had much in common with Carnap, but not anti-metaphysics. Young Quine inclined, as Tarski had done, towards the modest metaphysics of nominalism, holding out hope for a unified science with a modest, concrete ontology (section 4). In this book Quine also made refinements to, and developed further arguments for, his own ontological views – including his four-dimensionalism – and his theory of ontological commitment (section 5). The crucial work on analyticity, modality, and impure designation familiar from 'Notes on Existence and Necessity' is considered in its original Portuguese framing, and revealed to be entwined with Quine's commitment to extensionalism, and his desire to avoid abstract posits such as propositions and modal concepts (section 6). Lastly, I explore how his nominalistic leanings informed his philosophy of logic and

W.V. Quine's Philosophical Development, F. Janssen-Lauret, in *The Significance of the New Logic*, CUP 2018 mathematics (section 7).

## 2. *The Historical Story: Early Quine and the Period Leading Up To The Significance of the New Logic*

A deep admiration of *Principia Mathematica* had originally brought Quine to Harvard to work on a PhD with Whitehead. Unfortunately Whitehead had lost interest in mathematical logic some years before, when he had begun to devote himself to making sense of Einstein's general relativity by way of an involved and idiosyncratic event ontology. The more metaphysically cautious Quine concentrated on purging the *Principia* system of use-mention confusions. He completed his PhD on that topic, under Whitehead's rather lax supervision, in just two years. At the suggestion of Feigl Quine then secured a postdoctoral grant to travel to the European continent, in search of more like-minded spirits: the philosophers and logicians of the Vienna Circle and Polish School, but most of all Carnap.

Carnap's philosophy was driven first and foremost by a quest to make sense, in a scientifically respectable way, of truth, meaning, and justification as used in the empirical sciences and in logic and mathematics. In addition, it was driven by anti-metaphysical attitudes. Opposition to metaphysics was common among Carnap's colleagues of the Vienna Circle and the Polish School. It was motivated to an extent by justified fears among those left-leaning intellectuals about metaphysics in the neo-Thomist, Heideggerian, and Hegelian styles finding their way into and fuelling the rise of fascist ideologies on the European continent (Uebel 2016 §2.3). Carnap also thought of anti-metaphysics as an outgrowth of his semantic and epistemological project, his appeal to mathematical axioms as playing the role of implicit definitions of mathematical terms (Creath 1990b, pp. 5-6). Quine had fallen under Carnap's spell because of his semantics and epistemology. He admired Carnap's attempts to put logic and mathematics on a naturalistically solid footing. He was less taken with Carnap's anti-metaphysical attitudes, which he came to reject some time before he had articulated well-developed objections to Carnap's position on analyticity. Quine shared Carnap's pragmatist sympathies and was not drawn to traditional metaphysics of the Platonist, neo-Aristotelian, or Hegelian kind. Yet he took existence questions arising from science and mathematics seriously. He did not consider them to be rendered meaningless or obsolete by Carnap's programme. In this respect he resembled Frege, Russell, and Whitehead, as well as American pragmatists such as Peirce and James, not Carnap. Perhaps Quine had failed to develop an anti-metaphysical streak in part because the metaphysics of his culture of origin was much more sober and naturalistic than that of the cultures surrounding Carnap. Whitehead's event-ontology, James's empiricist anomalous monism, and Russell's project of logical construction, though not entirely Quine's style, were all informed by those philosophers' respect for empiricism and science. Unlike Carnap, Quine did not have cause to associate metaphysics with dangerous political authoritarianism. He always favoured a modest, empirically informed ontology.

In July 1934, some months before delivering the Carnap lectures (1990 [1934]) he was later to call 'abjectly sequacious' (Quine 1991, p. 266), Quine published his third journal article. It was his first

publication on a topic other than mathematical logic. Its title was 'Ontological Remarks on the Propositional Calculus', and its aim was to undermine what he describes as Frege's and Wittgenstein's views that sentences are the names of special logical posits, such as propositions or truth values. In 1936, in 'Truth by Convention' he first published some of his reservations about analyticity. But those reservations were still fairly mild, elaborating on a suggestion made in the first Carnap lecture that it is easy to add further truths to the category of analytic stipulations (Creath 1990b, pp. 30-31; Ben-Menahem 2005, pp. 252-255). It would take him more than ten years to come to an alternative account of meaning, truth, and justification. As we'll see in section 6, by the time of *The Significance of the New Logic* Quine, though expressing some hesitation, continued to draw on the notion of analyticity (Quine 1944, p. 150-153). By contrast, Quine's account of ontology evolved far less hesitatingly, and more quickly. His theory of ontological commitment was almost fully formed by 1939. Two papers dating to that year express a version very close to the mature theory – except for some modifications which this book sheds light on, discussed in section 5. While certain expressions designate objects – these papers say – others, the syncategoremata, are meaningful without designating. If existentially generalising on some expression is truth-preserving, that indicates that the expression designates an entity. In this way we can dispel apparent difficulties about non-existence claims lacking subject matter, and meaningfully compare the advantages of nominalistic vs. realistic languages (Quine 1966 [1939], Quine 1939a). The earlier of the two 1939 papers was not published until 1966, the *Erkenntnis/Journal of Unified Science* volume it was due to appear in having been derailed by the Second World War.

The Nazi occupation which precipitated that war proved catastrophic for Quine's friends, the members of the Polish School and the Vienna Circle. Many of them were Jewish, or left-wing and politically active. Those who could fled to the US or UK. Several of those who could not were murdered by the Nazis, such as the logicians Janina Hosiasson, Adolf Lindenbaum, Moses Presburger, and Mordechaj Wajsberg. The Polish logicians had made a significant impression on Quine. Tarski's name occurs frequently in *The Significance of the New Logic*. Lukasiewicz is also cited in its short bibliography. Another small sign of Polish influence is Quine's use of Kotarbinski's term 'gnoseology' (meaning 'theory of knowledge'; see the title of Kotarbinski 1966 [1929])<sup>2</sup> to rebut Carnap's conventionalism (Quine 1944, p. 18).

Quine had looked on in horror as Hitler occupied more and more of Europe in the late '30s. He regularly voiced his worries about their European friends in letters to Carnap, who had already emigrated to the US in 1935 (Quine 1990, pp. 260-268). Tarski, who was also Jewish, arrived in 1939. He held a temporary position at Harvard for some time, partly thanks to Quine's efforts (Quine 1990, p. 268). There he discussed logic, meaning, truth, and mathematical finitism with Quine and Carnap in 1940-41. Carnap's shorthand transcripts of their conversations have recently been deciphered, translated, and published (Frost-Arnold 2013). Tarski maintained – with Quine, against Carnap – that some scientifically respectable sense could be made of the old nominalism-Platonism debate (see also Quine 1990, p. 295). A truly nominalistic

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Thanks to Thomas Uebel for bringing this point and Kotarbinski's book to my attention.

mathematics, not invoking abstract numbers, sets, or expression types, might have to be finitist if there is a finite number of physical things in the universe, which Tarski thought might be the case (Carnap 2013 [1940-41], p. 153). It follows that certain statements generally held to express analytic mathematical truths, such as those expressing the existence of infinite sets or series, turn out not to be analytic after all.

Discussing these ideas with Tarski may well have sparked or encouraged Quine's idea that it is possible, not only to add extra analytic stipulations to our theories as he had maintained in 1936, but also to subtract some of them (Mancosu 2005, Frost-Arnold 2013 pp. 84-87). By the early forties Quine had not yet completely given up on analyticity; it would take him another ten years to express in print the view that any stipulation is potentially revisable.

As the war raged on in 1941 and '42, Quine was left with little time for philosophical research (Quine 1996, Preface). Having felt duty-bound to help defeat the Nazis, he had signed up for a technical assignment in the US navy. His time was wholly taken up by a combination of teaching and preparing for his war work, until he was offered, and accepted, a three-month visiting professorship in São Paulo. A keen amateur linguist already proficient in French and German, Quine had picked up some conversational Portuguese while on sabbatical in the Azores in 1938. He was allowed to defer his commission as a naval officer, and flew to Brazil in May 1942. First he delivered a lecture, 'Os Estados Unidos e o ressurgimento da logica', whose translation appears alongside the book in this volume, to the União Cultural Brasil-Estados Unidos. But his primary task was a Portuguese-language lecture course aiming to introduce the new logic to Brazil, both its technical advances on the old Aristotelian logic and its potential for scientific and philosophical applications. The philosophy he had lacked the time to work on began once again to fall into place. He received significant help with the Portuguese from his Brazilian assistant, Vicente Ferreira da Silva, whose book on mathematical logic (Ferreira da Silva 1940) he had previously reviewed, and who later became a well-known existentialist (Quine 1997, p. 6). With Ferreira da Silva's help, Quine began to prepare the lectures for publication in book form. He did so partly because he was keen to publish the new material and to leave a legacy in Brazil, but also because the war had made him fear for the future of the Western world. His three-month appointment and the looming Navy commission left Quine pressed for time. He wrote all night. He lived off deep-fried street food. With days to spare, he finished correcting the proofs for *O Sentido da Nova Lógica* (Quine 1997, p. 7). Quine's usually consummate attention to detail could not quite withstand the pressure and the sleep-deprivation; the book contains some misprints and typographical errors, indicated here in editorial footnotes and corrected in the text. There also appear to be some philosophical loose ends, half-finished trains of thought never quite completed, or picked up in a modified form several years after the war, when Quine's thinking had shifted to an extent. After completing the book, his technical work in the Navy took up nearly all of his time and attention until the war ended. Quine worked, with dedicated groups of mathematicians and cryptanalysts, on translating and analysing intercepted submarine communications – apparently quite successfully, as he was highly commended by his admiral (Lodge, Leary, and Quine 2015,

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Meanwhile the publication process of *O Sentido da Nova Lógica* dragged on, much to Quine's annoyance. It was held up by bureaucratic interference, the non-existence of Portuguese-speaking mathematical logicians to serve as plausible manuscript referees, and typesetting troubles. The first edition was finally published in 1944, on the rather brittle paper which resulted from shortages during the second world war. Copies are now very rare. A second edition followed in 1996, with a new preface by Quine, and a third edition in 2016 (Quine 1996, Quine 2016). Our translation is based on the first edition, and references to the text will be based on first edition page numbers, indicated in square brackets within the translation.

### 3. The Significance of the New Logic: *The Book and Its Content*

What Quine called 'the new logic' was indeed rather new in 1942. Kurt Gödel's incompleteness proof, published in 1931, was only eleven years old. One year earlier Susan Stebbing had published the first accessible book on contemporary logic and its philosophy (Stebbing 1930). Tarski's work on truth dated from 1933, but that was the Polish version; Quine and Carnap, who spoke German but no Polish, had had to wait for the German translation of 1935. In his Introduction to this book Quine described the new logic as a response to Cantor's advances in transfinite arithmetic (Quine 1944, pp. 12-14) and to Russell's paradox and the related semantic paradoxes (Quine 1944, pp. 14-15). The need for a new philosophy of logic had also become apparent. While we might previously have tried to identify logical (and mathematical) truth with provability, Gödel's incompleteness result made that identification impossible (Quine 1944, p. 20). Quine proposed instead a conception of logic as a universal science, one compatible with any area of enquiry. Such a universal science would treat all subject matters, and all objects, equally.

*The Significance of the New Logic* has some areas of overlap with Quine's introductory logic textbook *Elementary Logic* (Quine 1941) and with his expansive and technical *Mathematical Logic* (1940). Like *Elementary Logic* and *Mathematical Logic*, it takes as a point of departure a tripartite division of logic into the theory of composition (sentential logic), the theory of quantification (which together with sentential logic yields predicate logic), and the theory of classes. *The Significance of the New Logic* is more ambitious in scope and subject matter than *Elementary Logic*, which only covers the theories of composition and quantification. But it differs from *Mathematical Logic* in being aimed at a non-expert audience. Convinced of the new logic's potential for revolutionising science and mathematics, Quine took on the task of introducing analytic philosophy neophytes not only to recent advances in philosophical thinking about identity, existence, meaning, modality, and description, but also to the theory of classes.

The book's philosophical remarks on statements, in part I which focuses on the theory of composition, have much in common with those in *Elementary Logic*. In both books Quine took statements, the substituends for the *ps* and *qs* of sentential logic, to be declarative sentences with timeless verbs and without indexicals, articulating a sort of precursor of his later account of eternal sentences (Quine 1941, p. 6,

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Quine 1944, pp. 26-28, Quine 1960, §§ 36, 40). In both books he appealed to pragmatic reasons to explain away apparent paradoxes of the material conditional, a strategy we now associate with the later works of Grice. Quine was an early adopter of this style of argument in *Elementary Logic*, though the argument in *The Significance of the New Logic* is worked out in more detail: 'In practice we do not utter conditionals when the truth values of their components are already known. But this does not stop us from identifying 'if p then q' with ' $\sim(p \cdot \sim q)$ ', because it is equally obvious that in practice we would not use a compound of the form ' $\sim(p \cdot \sim q)$ ', any more than 'if p then q', when we already know what the truth values of the components are ... we could provide more information in less space by only affirming 'q' or denying 'p'.' (Quine 1944, pp. 48-49; cf. Quine 1941, p. 21). In both books he proposed to read 'or' as inclusive, but in this book he adds some further arguments for that conclusion. They include one natural-language case due to Tarski (Quine 1944, pp. 44-46), and further appeals to pragmatics: 'consider the expression ' $x \leq y$ ' ... ' $x < y$ ' and ' $x = y$ ' are in themselves mutually exclusive, or incompatible ... ' $\sim(x < y \cdot x = y)$ ' [is] added to the statement [ $\sim(\sim x < y \cdot \sim x = y)$ ] with the inclusive sense to produce a statement with the exclusive sense. But this additional conjunct is a known truth (given any x and y) that we can therefore freely insert or omit. To omit it is not to deny it; we never say everything that we know' (Quine 1944, pp. 44-45). Quine's philosophical reflections on quantification theory in part II do not go far beyond those of *Elementary Logic*, apart from a practical application to insurance calculations also discussed in his 'Relations and Reason' (Quine 1939b). New material on the philosophical applications of quantification appears in part III, including several forerunners of arguments made famous by 'On What There Is' (Quine 1948). The technical treatment of predicate logic in this book resembles *Mathematical Logic* more than *Elementary Logic*, using truth-table techniques for sentential logic and matrices for quantification theory.

*The Significance of the New Logic* deploys a simplified version of the symbolism of *Principia Mathematica*, with parentheses to avoid ambiguity, a single (universal) quantifier and two primitive sentence connectives – the tilde for denial, and the *Principia* dot ' $\cdot$ ' for conjunction. (Apparently unknown to Brazilian typesetters, the *Principia* dot comes out looking rather square and elongated in the first edition, and has transmogrified into an underscore by the second.) All the other operators of predicate logic are defined in terms of those three primitives; the primitive of membership is added in part IV. This system is austere, just one step removed from the simplest possible system with just one primitive each for the theories of composition, quantification, and classes – that is, the Sheffer stroke, universal quantifier, and membership sign respectively. Quine impressed upon the reader how much can be proved within this tiny yet powerful symbolism: in particular, the logicist conclusion of *Principia Mathematica* that 'every mathematical law is an abbreviation of a logical law' (Quine 1944, p. 16).

*Principia Mathematica* also looms large in the philosophy this book contains, both with respect to its treatment of intensionality and its treatment of classes. Quine sought to unite the logico-mathematical power of Frege's work and of *Principia* with his preference for an austere extensional language (also see section 6).

Frege had invoked abstract senses. *Principia*, at least according to Quine's interpretation of it, retained some proposition-like entities under the guise of facts (Quine 1981 [1966], pp. 81-82). Quine wanted to steer clear of such posits. The material excerpted for 'Notes on Existence and Necessity' is framed differently in this book: as an explicit answer to Frege's use of senses as the referents of phrases in intensional contexts (Frege 1892). Quine felt he had made a great leap forward in *The Significance of the New Logic* by (tentatively) invoking linguistic objects, words or sentences in quotation marks, instead of senses. Propositional attitudes can then be accounted for – without violating extensionality – as attitudes to sentences, and necessity as ascription of analyticity to a sentence. Progress in this area also informed Quine's account of ontology. Names, too, are on occasion used in intensional contexts where they are not (or not purely) designative – they do not designate a referent (or not only a referent), but a linguistic object. This, combined with Russell's theory of descriptions, implies that ontological commitments cannot be incurred by the use of names, but only by bound variables in existential quantifications: 'the pronoun is always the main vehicle of reference to objects; this was made apparent by our reflections on the non-designative occurrence of names... now the pronoun, which was already the main vehicle of reference, has become the only one' (Quine 1944, p. 174). New arguments in favour of his theory of ontological commitment also appear in this book, forerunners of arguments used in 'On What There Is', rebutting Meinongianism and propounding the univocity of ontological vocabulary (see section 5).

The theories of composition and quantification were then, and are now, held to be logic unequivocally. How to classify the third item on Quine's tripartite list, the theory of classes, was less obvious. Frege, Russell, and Whitehead counted the theory of classes as logic, too; that assumption was necessary to their logicist project. But Quine leaned towards considering the theory of classes part of mathematics (Quine 1941, p. 3). Why, then, did Quine so boldly assert 'Pure mathematics is reducible to logic' in this book (Quine 1944, p. 16), having previously attached more qualifiers to the logicist thesis (Quine 1941, p. 3, Quine 1940, p. 5)? There is no explicit answer in this book. To an extent this is one of its loose ends not fully tidied up before Quine was rushed to the end of his stay in Brazil, and thus to the end of the book. An implicit answer may lie in Quine's virtual theory of classes (Quine 1944, pp. 218-223).

Frege's original version of the theory of classes had seemed simple, elegant, and intuitive. But it was famously inconsistent. Assuming that for any specified condition a corresponding class exists, it entailed the existence of self-membered classes – for instance, the class of all classes – as well as non-self-membered ones – for instance, the class of all elephants. Russell's paradox loomed: the class of all non-self-membered objects both is and is not a member of itself (Quine 1944, p. 15). A variety of restrictions on the conditions which determine a class were proposed. *Principia Mathematica's* version deployed the theory of types to yield the necessary restrictions, and reduced arithmetic to logic in that way. Yet it was criticised for relying on two arguably non-logical axioms: the axiom of reducibility and the axiom of infinity, which states that there are infinitely many things in the world. (As we saw above, this was an assumption Tarski had

W.V. Quine's Philosophical Development, F. Janssen-Lauret, in *The Significance of the New Logic*, CUP 2018 denounced as intolerable at Harvard in 1941, and the young Quine had been inclined to agree.) In *The Significance of the New Logic*, Quine opted for a restriction he attributed to von Neumann: 'certain classes cannot belong to classes. We call *elements* all objects that are members of classes ... the new *restricted principle of abstraction* will be that, given any matrix whose free pronoun is 'x', there is a class whose members are exactly the *elements* (instead of 'objects', as earlier) that satisfy the matrix' (Quine 1944 p. 193). But Quine also added the virtual theory of classes – concisely expressed in a single section (Quine 1944, pp. 218-223) – which he regarded as a breakthrough because it allowed him to simulate quantification over classes or sets. Initially the class membership notation had been introduced with variables of quantification on either side, as in ' $x \in y$ '. But to say that x is a member of y is, *prima facie*, to affirm the existence of both x and y. The virtual theory of classes sidesteps the question of the existence of classes by dropping the primitive predicate of membership altogether. Instead certain set-theoretic principles are taken to be definable in terms of schematic predicate letters, such as ' $f = g$ ' for ' $(x) (fx \equiv gx)$ ' (for monadic f and g; ' $(x) (y) (fxy \equiv gxy)$ ' for dyadic f and g, and so on up). The underlying principle is that statements of the form 'y is a member of the class of f things' – ' $y \in \hat{f}x$ ' – are translated into the form 'fy', so that no variables range over classes.

A virtual theory of classes will be weaker than the full theory of arithmetic (Quine 1944, pp. 222-223). But for any finite collection of objects, each of which can truly be said to satisfy some predicate, statements involving those predicates can be translated into set-theoretic language by means of the virtual theory. Tarski, the year before, had instilled in Quine a desire to find a finitist mathematics, one that applied exactly to the things contained within the physical world. It may be that Quine was hopeful that his virtual theory of classes could help provide the physicalistic, finitist mathematics Tarski had longed for, avoiding Russell and Whitehead's implausible claim that the existence of an infinite number of objects was *a priori* or analytic. The war intervened, and by the time Quine returned to set theory, his commitment to nominalism had waned. Finitist mathematics no longer seemed philosophically viable. Later on, Quine put the virtual theory to good use elsewhere, in support of his position that logic proper, unlike set theory, has no ontology (Quine 1970, pp. 66-68). That position, too, had already been apparent in *The Significance of the New Logic*, where he credited to Tarski the insight that 'Whatever logic asserts is what can be asserted about the objects of any of the sciences' (Quine 1944, p. 17). Quine took it to imply that logic cannot have an ontology of its own. 'The theory of classes, in contrast with logic in the strict sense, implies an ontology' (Quine 1944, p. 190). His philosophy of logic was always deeply entwined with his views on ontology, although his the latter grew more permissive over the years (e.g. his views on mathematical ontology discussed in section 7 below). In this early period, Quine – perhaps partly under the influence of Tarski, whose name is frequently mentioned in this book – still entertained the possibility of a nominalistic ontology.

#### 4. Early Quine's Nominalistic Tendencies

Even when he still favoured Carnap's views on language and epistemology, the young Quine had been unimpressed with the positivistic contention that metaphysical claims lack meaning in any scientifically respectable sense. Positivists held that all metaphysical claims and their negations were pseudo-statements, not verifiable and therefore not capable of being properly speaking true or false. Quine had not adhered to that doctrine even in 1934, in his 'Ontological Remarks on the Propositional Calculus'. Having raised the metaphysical-sounding question 'what manner of things are these, whose names are sentences?' (1934, p. 472) he did not, as a positivist would have done, dismiss it as meaningless and unanswerable. He considered some possible answers to the question – facts, propositions – before providing his own answer: there are no such entities. To the positivist, a negative answer to an ontological question is as bad as a positive one. A pseudo-statement and its negation are equally nonsensical; the nominalist is just as much of a metaphysician as the realist. Even at this early stage, while still a self-professed Carnapian, Quine was flouting positivistic proscriptions. Just like Frege or Russell, he engaged in ontological enquiry. Five years later, while still in thrall to Carnap in many respects, he addressed positivist anti-metaphysics outright, and rebutted it: 'We are tempted at this point to dismiss the whole issue between nominalism and realism as a metaphysical pseudoproblem. But in thus cutting the Gordian knot we cut too deep' (Quine 1939a, p. 704). And by the time Quine came to Brazil, he had explicitly made it part of his mission to explain the new logic's utility in making ontology scientifically respectable again, aiming to answer 'even questions of an ontological nature such as 'What is there?' and 'What is real?'' (Quine 1944, p. 22), and to overturn 'the conclusions of the Vienna Circle', as Chisholm notes in his review of Quine's lecture (Chisholm 1947, p. 484).

What alternative to positivist anti-metaphysics did Quine propose? A common theme throughout Quine's body of work, early and late, is a modest, frugal, naturalistic account of metaphysics, concentrating especially on assessing what existence claims we have reason to believe based on our best scientific theories (Janssen-Lauret 2015, pp. 147-154; Janssen-Lauret 2017, pp. 250-255). But what kinds of things he admitted as modest, empirically-based posits varied over the years. In these early works, Quine still harboured hope that some form of nominalism, some philosophical view 'admitting only concrete objects' (Quine 1944, p. 180), might win the day. He still thought that a unified science drawing only upon nominalistic resources might materialise, even though it appeared difficult to achieve. As he had said in 1939: 'nominalism can be formulated thus: it is possible to set up a nominalistic language in which all of natural science can be expressed' (1939a, p. 708).

The later Quine is sometimes interpreted as a nominalist because of his aversion to positing such things as properties, propositions, and possibilities. But by that point, Quine himself had relinquished the label of 'nominalist'. He took several of the positions he held to be incompatible with nominalism, especially his commitment to abstract objects owing to quantification over numbers in physics (Quine 1981), and his diffidence about the distinction between concrete and abstract objects following advances in field theory

W.V. Quine's Philosophical Development, F. Janssen-Lauret, in *The Significance of the New Logic*, CUP 2018 (Quine 1976, p. 499). Even in the earlier works his nominalist leanings were rather tentatively expressed.<sup>3</sup> In *The Significance of the New Logic*, he stopped short of outright committing himself to nominalism. At several crucial points he devoted space to discussing nominalists' commitments – refusing to posit numbers at all, refusing to posit numbers which do not number any collection of physical objects (p. 161), having a distaste for classes and properties (p. 180-183) – and treated them sympathetically. He remarked that opponents of abstract objects might view the failure of the unrestricted principle of class abstraction, and Gödel's incompleteness proof, as victories (Quine 1944, pp. 234-235). A few years later he was to cite incompleteness and the class paradoxes as 'motivations for nominalism' (Quine 2008 [1946], pp. 18-19). Still, back in the early forties, he also claimed that we must prioritise robust examination of the apparently realist foundations of mathematics over our 'prior ontological dogma' (Quine 1944, p. 180).

There appears to be some echo of Carnap on the last page of this book, where some role is still assigned to 'pseudo-statements' (Quine 1944, p. 235). But Quine's use of the label was misleading. The statements in question are not metaphysical. Nor are they dismissed as useless. They are the statements of classical mathematics, and the reason that they fall short of being statements is that although they are useful, there are no abstract objects for them to be true (or false) about.

In *The Significance of the New Logic* and other nominalistically-inclined writings of the period Quine gave no explicit argument in favour of nominalism, but wrote in his Harvard Nominalism lecture, 'I'll put my cards on the table now and avow my prejudices: I should like to be able to accept nominalism' (Quine 2008 [1946], p. 9). These days, Quine's austere ontology is often attributed to an adherence to the maxim 'no entity without identity'. But worries about identification were less central to Quine's opposition to abstract posits in the early '40s. It is true that he notes that the identification criteria for classes are very clear, while the answer to the question 'under what condition do two matrices determine the same attribute?' (1944, p. 182) is obscure. But the early Quine remained dissatisfied with classes despite their clear criteria of identity. He complained that they, 'being abstract objects, are less clear and familiar than we might wish' (1944, p. 181). Later on in the book he attempted to do away with them altogether by means of the virtual theory. At the time, his main objection to positing classes appears to have been their purported abstract nature rather than their criteria of identity. In this respect his position at the time resembled classic nominalism more than his mature views on ontology. It was only around the time of 'On What There Is' (1948) that concerns about identification began to outweigh nominalistic factors in Quine's estimation. While in 1947, he had written off possibilities as incompatible with materialism (Quine 1947, p. 47), in 1948 his main argument against possibilities was that they lack clear criteria of identity (1948, p. 23). Generally, his reliance on criteria of identity appears to have grown as his conception of objects became more structuralist over the years, viewing posits increasingly as best explanations of intersections in our network of observations (Janssen-Lauret 2015, pp. 155-157). By the early '40s Quine's justifications for preferring one range of posits over another had not

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<sup>3</sup> An exception is Goodman and Quine 1947, but since it is a joint paper, the more explicit expressions of nominalism there may indicate Goodman's influence rather than a change of heart on Quine's part.

yet reached that level of sophistication. He articulated no argument stronger than our finding concrete posits more 'clear and familiar' than abstract ones (Quine 1944, p. 181). Since the early Quine showed no inclination to doubt our right to talk about and assume the existence of physical objects like rivers (Quine 1944, p. 135-136) or horses (Quine 1944, p. 159-161), he may have been trying to dispense with the abstract in a quest for ontological parsimony. A sparse nominalistic language in which to formulate a unified science still seemed potentially within reach. Several of the moves made in this book make more sense when viewed through this modestly metaphysical, nominalistically inclined lens.

### 5. *Ontology and Meta-Ontology*

*The Significance of the New Logic* contains new material both on the topic of Quine's ontology – his answer to the question 'what exists?' – as well as what has come to be called his 'meta-ontology' – his account of how existence claims are attributed to speakers or theories – which Quine himself tended to call 'ontological commitment', 'ontic commitment', or 'imputations of ontology'. Quine was physicalistically inclined; his physicalism went hand in hand with his nominalistic sympathies. Although this book focuses on logic and its philosophy, his physicalism is visible in his expressions of four-dimensionality about ordinary objects. Quine had first appealed to four-dimensionality in 1939. Even then he had treated it as rather old hat, a position obviously familiar to his audience: '[t]he four-dimensional spatio-temporal view of nature is a device for facilitating logical analysis by rendering verbs tenseless' (Quine 1939a, p. 701). In *The Significance of the New Logic* he went beyond that familiar point – 'Bucephalus is an extended portion of the spatio-temporal world [with] a spatial extension of several hectoliters and a temporal one of several years ... far away from here' (Quine 1944, p.159) – and developed an early version of the position of 'Identity, Ostension, and Hypostasis' (Quine 1953 [1950]). He deployed four-dimensionality in giving an account of the persistence of everyday objects. 'Consider the river. It is an extended object, in time as well as in space ... [it] remains the same river while it lasts; it remains the same identical totality of its various instantaneous states' (Quine 1944, p. 136). Such persistence conditions are used in this book to demystify apparent puzzles of change and identity over time. Later Quine saw them as contributing to a criterion of identity for rivers by, as he put it in the later, further developed version, 'reading identity in place of river kinship' (Quine 1953 [1950], p. 66). In this book the notion of criteria of identity remains embryonic, not yet fully articulated.

Quine stressed that while nominalism is a constraining force on the nominalist's own ontology, it does not constrain a Quinean meta-ontology. Ontological commitments can be incurred to numbers or properties just as much as to rivers, horses, or particles; 'there is' and 'exists' mean the same whether the purported objects are concrete or abstract. This argument, the argument from the univocity of ontological vocabulary, is one of several arguments presented for the first time in this book which are clear precursors to arguments made famous by 'On What There Is'. In this book, as in that paper, Quine held that ontological vocabulary does not shift its meaning depending on what name or description it is concatenated with: '[t]hose

who doubt (3) ["There is such a thing as the number  $9^{9^9}$ "] as well as those who accept (3), understand the phrase 'there is such a thing as' in (3) in the same sense as in (1) ["There is such a thing as Bucephalus"] and (2) ["~ there is such a thing as Pegasus"] (Quine 1944, p. 161). Here, as there, he claimed that it is not 'exists' that has spatio-temporal connotations, but certain terms purportedly designating certain objects: '[t]o deny that there is such a thing as Pegasus means that the object is not found in space and time, but ... only because, if there were such a thing as Pegasus, it would be a spatio-temporal object' (Quine 1944, p. 161).

The example of the non-existence of a disease – where diseases are taken to be abstract objects – is used in this book as well as in 'Designation and Existence', but in support of different conclusions. In 1939, Quine had used the non-existence of the made-up disease hyperendemic fever to infer that 'understanding of a term ... does not imply a designatum' (Quine 1939a, p. 703). In *The Significance of the New Logic*, by contrast, he used the example to invalidate the distinction between existence (for concrete objects) and subsistence (for abstract objects). He contended that the distinction is void because empirical facts can prove the existence or non-existence of a purported abstract object: 'introduce the expression 'Paraná fever' as an abbreviation of the expression 'the sickness that annihilated the majority of the inhabitants of Curitiba in the year 1903'. The question ... whether there is such a sickness as an abstract object – is resolved only by means of the observation of nature ... Paraná fever does not exist – nor does it "subsist", even as an abstract object' (Quine 1944, p. 162).

One of the well-known arguments in 'On What There Is' appears to have been partly inspired by Quine's assistant, the young Brazilian Vicente Ferreira da Silva. Objecting to the vague supposition that there are different kinds of existence, or existence in a 'plurality of worlds' (Quine 1944, p. 161), Quine cited his assistant's book as saying 'different forms of existence ... are completely puerile' (Ferreira da Silva 1940, p. 33, quoted in Quine 1944, p. 161). Here as in 'On What There Is', Quine rebutted the potential reply that Pegasus exists as a mental entity. 'The ideas of Bucephalus and Pegasus are not designated by the words 'Bucephalus' and 'Pegasus' in (1) and (2), but by other expressions: 'the idea of Bucephalus', 'the idea of Pegasus' (Quine 1944, p. 160).<sup>4</sup> All these new arguments in favour of a Quinean approach to ontological commitment may be connected to his novel conception, first put forward in this book, of logic as the science which applies to any domain of objects. Likewise, quantification may range over any domain of objects, concrete or abstract (Quine 1944, p. 145). A logic-based approach to the ontological problem, Quinean ontological commitment treats all objects, concrete or abstract, equally, just like logic itself treats all objects equally.

Lastly, a significant meta-ontological shift taking place in the early 1940s was Quine's severing the link between names and ontology. In Quine's first foray into ontology in 1934, he had focused wholly on names as denoting terms. Without mentioning variables at all, he reached the conclusion that sentences do not name any special logical posits. Such posits would, implausibly, turn rules of derivation into law-like

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<sup>4</sup> Frege also makes this point in 'Über Sinn und Bedeutung' (Frege 1892, p. 32), a paper which Quine cites as a notable influence on this book (Quine 1944, p. 140).

statements about certain objects: '[o]nce we postulate entities whereof sentences are symbols, the logical principles for manipulating sentences become principles concerning the entities – propositions – which the sentences denote' (1934, p. 473). Logical rules are better understood as governing sentences themselves, not objects to which sentences refer, and therefore 'the whole notion of sentences as names is superfluous' (1934, p. 473). Although it speaks of names instead of variables, the paper prefigures several of Quine's later ontological and meta-ontological convictions. Firstly, it shows him opposing positivist anti-metaphysics by taking existence questions seriously. Secondly, when we see him opting for the existence of sentences rather than propositions, his nominalistic and ontologically parsimonious tendencies are on display. Thirdly, it reveals that even at this early stage he explicitly connected the answers to ontological questions with the designating expressions of a true theory.

By the late 1930s Quine had begun to use the mediaeval term 'categoremata' for expressions which designate objects, and 'syncategoremata' for terms which are meaningful without standing for something. Proper names are a typical example of the former; typical examples of the latter are such things as brackets, punctuation, and logical connectives. The mediaeval nominalism-realism debate was phrased in terms of the question whether predicates were syncategorematic or categorematic. In 1939 Quine had still thought that names were the expressions which revealed a theory's ontology. 'To ask whether there is such an entity as roundness is thus not to question the meaningfulness of "roundness"; it amounts rather to asking whether this word is a name or a syncategorematic expression' (Quine 1966 [1939], p. 197). He distinguished, then, between apparent names and names 'in the semantic sense', that is, names with bearers. Only the latter stand for existents. Only they, not apparent names, are relevant to ontology: 'the word "Pegasus" is not a name in the semantic sense, i.e., ... it has no designatum' (Quine 1939a, p. 703). Although 'Existence and Designation' contains the phrase 'to be is to be the value of a variable', and puts it to ontological use, at the time Quine still spoke of genuine names being substituends for variables – the real word-world connection was still presumed to lie with names. By the late forties, he had explicitly abjured any utility of proper names to ontology. By that point, he took only variables, not names, are the paradigmatic categoremata: 'The use of alleged names is no criterion, for we can repudiate their namehood at the drop of a hat unless the assumption of a corresponding entity can be spotted in the things we affirm in terms of bound variables' (Quine 1948, p. 32). When and why did Quine's change of heart occur?

We first find Quine stating that names are inessential in *Mathematical Logic*, on the grounds that they can always be converted into Russellian definite descriptions (Quine 1940, p. 151).<sup>5</sup> *The Significance of the New Logic* combines an expanded version of the *Mathematical Logic* argument with Quine's novel distinction between occurrences of names which are purely designative, serving only to single out their designata, and occurrences which are not purely designative. The latter do not merely talk about their designata (if they have them at all), but say something about an expression they occur in. 'Giorgione is so-

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<sup>5</sup> Quine's argument here is of dubious validity. For details, see Janssen-Lauret 2016, pp. 597-601.

called because of his size' says something about the name 'Giorgione', as well as about the artist Giorgione. 'Pegasus does not exist' says something about the term 'Pegasus' – namely, that it does not designate. It does not say something about the winged horse Pegasus – in particular, it does not attribute the special attribute of non-existence to him – because there is no such horse. Quine started out by distinguishing, as he had in 1939, between names in the semantic sense, which always designate, and terms which look like names but may or may not designate, which he called substantives (Quine 1944, p. 158). But he began to prepare the ground to admit only one kind of substantive: the pronoun. 'It is not the mere use of a substantive, but its designative use, that commits us to the acceptance of an object designated by the substantive' (Quine 1944, p. 165). With that distinction in place, Quine was in a position to dispense with names for the purposes of ontology.

One key difference between occurrences which are purely designative and occurrences which are not is that the former do allow for existential generalisation, but the latter do not. Apparent names can have non-designative occurrences; variables in existentially quantified claims cannot. So only bound variables in existential quantifications are truly categoremata; names are not. Quine then proceeded to introduce a convention for eliminating names altogether: convert them all into descriptions. Descriptions, in turn, are analysed in the Russellian way as quantifier phrases beginning with existential quantifiers. Thus they wear their ontological commitments on their sleeves. Some names already have a descriptive matrix associated with them but, Quine argued, even if the names are primitive, they can easily be transformed into a descriptive matrix. We turn the name into a verb, such as 'europizes' for 'Europe', or 'pegasizes' for 'Pegasus'. Quine had arrived at the more familiar formulation of ontological commitment: 'All objects remain as before, but contact between objects and language is concentrated in the pronoun. The ontology to which a given use of language commits us simply includes the totality of objects within the range of the quantifier.' (Quine 1944, p. 175).

But the *Significance of the New Logic* position is to an extent unstable. It has trouble accounting for certain parts of the logic of identity. Although it is a logical truth that everything is identical to itself, it is always logically possible for two things satisfying all and only the same predicates and descriptions to be, nevertheless, distinct. As Barcan Marcus pointed out, the equivalence expressed by means of two descriptions is weaker than that expressed by two names flanking the identity predicate. Although in natural language we might write 'The author of Jane Eyre = the older sister of Emily Brontë', its underlying logical form is really ' $\exists x((Ax \wedge \forall y(Ay \rightarrow x = y)) \wedge \exists z(Sz \wedge \forall w(Sw \rightarrow z = w)) \wedge x = z)$ '. Only variables appear next to the identity sign in that sentence. Names can also flank the identity sign – as in ' $a = b$ ' – but descriptions themselves cannot. Barcan Marcus argued that this was because descriptive vocabulary and names have importantly distinct logical roles. Descriptive vocabulary employs predicates to ascribe characteristics. Even if certain predicates are uniquely satisfied, from a logical point of view, predicates have a semantic role which enables them to apply to more than one thing. By contrast, names have the special semantic role of referring directly to individuals; therefore they can only apply to one thing. Jointly with identity, names can

be used to express sameness of thing. Descriptions only encode sameness of characteristics, which does not logically guarantee sameness of thing – even if in certain cases it is sufficient to infer sameness of thing (Barcan Marcus 1961, p. 310). Quine's 1940s position is vulnerable to the objection that it leaves no role for the logical truth that indiscernibles can always be distinct.

Quine's mature position circumvented this objection by combining the dispensability of names with an idiosyncratic interpretation of the identity predicate. The later Quine replied to Barcan Marcus that according to his view, the identity sign is not a logical predicate, expressing sameness of thing. It is a dummy predicate expressing, for each language, indiscernibility with respect to all the predicates of that language (Quine 1961).

### 6. *Impure designation, Quotation, Modality and Extensionality*

The historical context, and early Quine's nominalistic leanings, also help us understand the connections drawn in this book between impure designation, quotation, modality, and analyticity. Although nowadays all of these are considered separate, mostly independent matters, in Quine's early work they are all deeply entwined. Much of the work on impure reference, analyticity, and modality is already familiar to us because it was published in 'Notes on Existence and Necessity'. It is also well-known for its key influence on the debate between Quine and Carnap on semantics and analyticity. Quine's fledgling ideas sparked a large volume of correspondence between the two over the following year, all the more remarkable because Quine was kept very busy with his work for the US Navy (Creath 1990a, pp. 294-377). But again there is also an ontological side to the story. Quine's fast-evolving thoughts on quotation, designation, modality, and analyticity are tied together by their links to his account of ontological commitment and his own ontology. In addition, there are under-explored historical connections, not only to *Principia* but also to Frege.

Despite Quine's PhD and early publication record being focused on mathematical and philosophical logic, he had not had much exposure to Frege's work until the late 1930s, because it had not been widely available. We know that Quine must have looked at the *Grundgesetze* in the early '30s, since he cites it briefly (1934, p. 472). Still, Quine had not formed a full picture of Frege's importance to the field until he started adding historical notes to his *Mathematical Logic* manuscript. Even then, he only had limited access to Frege's writings. He could not find a copy of the *Begriffsschrift* in all of North America (1986a, p. 21). Nevertheless during his stay in Brazil Quine still appears to have been much struck by Frege. His assistant, Vicente Ferreira da Silva, had clearly noticed, as he gave Quine a portrait of Frege as a present. Years later Quine still reminisced about the sad loss of that picture on his flight home (Quine 1986a, p. 24). Frege's influence is also palpable in *The Significance of the New Logic*. Where 'Notes on Existence and Necessity' starts off with some brief philosophical remarks on identity and Leibniz's law, in the Portuguese original the material is framed in explicitly Fregean terms instead. There is a footnote attributing the 'essential content' (Quine 1944, p. 140) of the sections on impure designation and modality to 'Über Sinn und Bedeutung'

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(Frege 1892). Quine's efforts can be seen as an attempt to preserve Frege's insights compatibly with his own nominalist ontological sympathies.

Part III starts off on a pro-metaphysical, anti-positivist note with a rebuttal of early Wittgenstein's treatment of identity. The philosophy of logic of Wittgenstein's *Tractatus*, according to which all logical truths were mere tautologies and all philosophy a critique of language, had been enthusiastically endorsed by the philosophers of the Vienna Circle – especially by its 'right' wing, headed by Schlick and Waismann – who assigned mathematics to the realm of the tautologous, too (Uebel 2017, pp. 705-708). The early Wittgenstein had held that statements of identity are either empty or nonsensical, claiming we could not sensibly say that two things are the same, and only rather pointlessly say that one thing is one and the same. Quine swiftly dismissed him as 'not distinguishing carefully between objects and their names' (Quine 1944, p. 137), countering that it is perfectly sensible and not at all pointless to concatenate two distinct names of the same thing with the identity sign. Demystifying metaphysical disputes by carefully separating word and designatum is a crucial theme of these discussions, and also a principle central to Quine's views on ontology and meta-ontology. We saw above that he disavowed ontological commitment in cases where apparent names do not occur designatively. His answer to a host of confusions about metaphysical topics was to distinguish clearly between occurrences of substantives which are designative and those which are either non-designative or not purely designative.

In this book, Quine can be seen to be grasping towards an extensionalist theory. His preference was for a science stated wholly in extensional terms, on the model of the extensional theory of mathematics (Quine 1944, p. 158). Quine developed an analogy between statements of ontology, where the validity of existential generalisation indicates the assumption of an entity, and extensional statements, where quantification into a certain context yields sensible results and substitutivity of co-referential names is truth-preserving. As Frege had pointed out, Leibniz's law fails in contexts where we attribute propositional attitudes; we cannot freely substitute co-referential expressions for each other in those cases. Frege concluded that in such contexts, what is referred to is not what the referent would have been in extensional contexts, but rather the expression's sense. Abstract Fregean senses were unattractive posits to Quine, given his nominalistic leanings. He undertook to explain matters using only the less controversial posits of physical objects and human language. Although he was pleased with the suggestions he made in this book (Quine 1996, p. 7), they are often made rather tentatively (Quine 1944, pp. 144, 149). Some were later embraced enthusiastically, some were adapted to account for later development of his views.

While the ontological motivation was significant for Quine, there is one probable additional influence, namely *Principia Mathematica's* referential transparency. Although it is not discussed in this book, *Principia's* solution to substitution failures is closer to Quine's than Frege's. Russell and Whitehead had called an occurrence 'referentially transparent' just in case nothing is said of it, but by means of it something is said of something else (1964 [1910], Appendix C). Quine was later to embrace their

terminology, although by that point he applied it to contexts rather than occurrences (Quine 1953, p. 124). Like Quine in this book, and unlike Frege, Russell and Whitehead use a characterisation which implies that the the difference lies in whether the occurrence in question is wholly in the object language, being used only to denote or connote, or whether it in any way relies upon either the form of the expression itself or the form of the sentence in which it occurs. Like Quine's, Russell and Whitehead's characterisation leaves room for cases which rely on the reference as well as the form of an expression, although Quine is the only one among them who presents a worked-out version of such a case. Quine's version of the doctrine in this book suggests explicitly what *Principia* hints at: that non-purely designative occurrences – or in middle-Quine parlance, opaque ones – have an element of quotation to them.

The simplest such case is the straightforward quotation context, such as “‘Leibniz’ has exactly seven letters’. Here the opposite of referential transparency is true: something is said of the name, and the name is not used to say something of something else. That is, it occurs non-designatively. The statement quoted above is equally true whether the name stands for anything or not. Substitution of co-referential names fails: Leibniz was also called Gottfried, but “‘Gottfried’ has exactly seven letters’ is false. Existential generalisation fails, too: “‘Something’ has exactly seven letters’ is equally false. As we've seen, non-existence claims also contain non-designative occurrences of substantives. In 'Pegasus does not exist', the substantive 'Pegasus' is not used to say something of something else. But something is said of the substantive: that it does not name anything. Intersubstitutivity does not apply where there is no reference, and existential generalisation fails spectacularly, yielding the nonsensical 'There is something such that it does not exist'.

The case of 'Giorgione is so-called because of his size' is different. Here 'Giorgione' is used designatively. It is used to truly say something of something else, namely of the painter Giorgio Barbarelli, known as 'Giorgione', or 'big George', because he was large. Everything true of Giorgione must, by Leibniz's law, remain true if we refer to him by his last name. But Barbarelli is not so-called because of his size. The first quoted sentence of this paragraph becomes false upon substitution of co-referential terms, and meaningless upon existential generalisation on 'Giorgione'; there is no sense to be made of 'Something is so-called because of its size'. The occurrence of 'Giorgione' within the first quoted sentence has a dual role: something is said of it – that it applies by virtue of its referent's size – and by means of it something is also said of something else, because it singles out Giorgione. What is said of the painter in question is true not only because of what he is like but also because of the form of his name, since the Italian suffix '-one' connotes largeness. The occurrence is designative, but not purely designative. We need quotation to make clear what the point of the sentence is. When it is fully spelled out as 'Giorgione was called “‘Giorgione’ because of his size’, substitution of co-referential names and existential generalisation once again yield sensible results. 'Barbarelli was called “‘Giorgione’ because of his size’ and 'Someone was called “‘Giorgione’ because of his size’ are both true.

Quotation contexts can also be brought in to account for propositional attitude ascriptions. Suppose Philip knows Marcus Tullius Cicero only as 'Cicero', and is unaware of the English version of his *nomen gentile*. Then substituting 'Tully' for 'Cicero' in 'Philip believes that Cicero denounced Catiline' yields a falsehood – even though Quine optimistically entertained 'no doubt' at all that Philip does believe that of Cicero (Quine 1944, p. 143). Existential generalisation is also problematic: 'there is something such that Philip is unaware that it denounced Catiline' is not obviously a true statement about Marcus Tullius Cicero. How are we to interpret the that-clause in the first quoted sentence of this paragraph? Frege had held that it refers to a sense, an abstract propositional object. But Quine preferred to avoid abstract objects, and would rather continue on the path that had worked so well for him in explaining the Giorgione case: appealing to both the form of the expressions and their designata. 'Philip believes that Cicero denounced Catiline' likewise says something of 'Cicero denounced Catiline' as well as of Cicero and Catiline. Quine speculated that the real logical form of 'Philip believes that Cicero denounced Catiline' might be 'Philip believes the sentence "Cicero denounced Catiline"'. He was later to endorse this line wholeheartedly (Quine 1970, p. 14).

Lastly, Quine extended the quotation-context analysis to include modality. He tentatively put forward the suggestion that even modality might be quotational, if defined in terms of analyticity. In that case ' $\Box p$ ' might be rendered as an instance of the schema 'x is analytic', where 'x' is replaced with a quotation-name of the sentence substituted for 'p' in ' $\Box p$ ' (Quine 1944, p. 151). Modal statements, then, would simply be claims about sentences, too. But by invoking analyticity, Quine had gone beyond comfortably physicalistic talk of expressions and their spatio-temporal designata. It had become necessary to talk about meaning. As his account of meaning underwent a sea-change between this book and his mature period, this part of the account did, too. While Quine held firm to his quotation analysis of propositional attitudes, his account of modality eventually expanded to make some limited sense of essence (Janssen-Lauret 2017, pp. 261-262). The quotation analysis of 1944 blocks all quantification into modal contexts, and Quine continued to maintain that such quantification made no sense in 1951 (p. 22). Under the influence of Barcan Marcus (1947, 1961, 1967), Quine grudgingly began to admit that such quantification was coherent. Even essence, he eventually conceded, was not a wholly incoherent notion, merely an inconstant one, varying with the context of enquiry (Quine 1960, p. 199; Quine 1976 [1972], p. 52). So the analysis of modal sentences was modified more than any of the other quotation-based analyses presented in this book owing to shifts in Quine's semantic views.

The topic of meaning, and especially analyticity, was one Quine had been dancing around since the beginning of *The Significance of the New Logic*. We can see from his letters of the following year that part of his struggle was his re-evaluation of Carnap's views. There are clear signs that he was further separating himself from his teacher in this book. In the Introduction Quine had claimed to have 'expressed doubt that ... conventionalism has any meaning at all' (Quine 1944, p. 19) in 'Truth By Convention' – a rather stronger statement than he had actually made in 1936. Again, there are also ontological concerns – which Carnap

would not have countenanced – driving Quine's fast-evolving attitudes towards analyticity. Even between writing the book and translating himself Quine's convictions appear to have grown stonger. In the original book, he had said: 'what the *meaning* of an expression is – what kind of object – is not yet clear; but it is clear that, given a notion of meaning, we can explain the notion of *synonymity* easily as the relation between expressions that have the same meaning. Conversely also, given the relation of synonymity, it would be easy to derive the notion of meaning in the following way: the meaning of an expression is the class of all the expressions synonymous with it. Perhaps this second direction of construction is the more promising one' (Quine 1944, pp. 149-150). By 'Notes on Existence and Necessity', the 'Perhaps' had become a 'No doubt'. The quotation also shows Quine clearly expressing unease about construing meanings as a special kind of object. His idea that presupposing synonymity as primitive and explicating 'meaning' in terms of it might provide an alternative to taking meaning as primitive, presumed explicable by positing meanings, is also likely to be explained by his opposition to positing abstract objects.

Part of the growing rift between Quine and Carnap on analyticity was forged by their diverging positions on extensionality. Here it was not just Quine who changed his mind, but Carnap, too. Having originally agreed with Quine that only extensional languages were acceptable, in 1938 Carnap had begun to dabble in intensional metalanguages, citing his principle of tolerance. Quine, having heard of this through Hempel, shot off a rather ill-advised letter telling Carnap 'your principle of tolerance may finally lead you even to tolerate Hitler' (Quine 1990, p. 241). Carnap was provoked enough to depart from his usual mild-mannered style in his reply, comparing the anti-intensional philosopher to 'an entomologist who refuses to investigate fleas and lice because he dislikes them' (Carnap 1990, p. 245). Quine could not dissuade him from continuing down an increasingly intensional path, culminating in his advocating modal logic (Carnap 1947). In *The Significance of the New Logic*, Quine made his opposition to intensional constructions apparent, but was less clear on what his argument against them was. He stated that intensionality is not needed in mathematics, that intensional contexts are difficult to formulate 'clearly and exactly' (Quine 1944, p. 157) and that they have the same defects as quotation contexts. Again it appears plausible that Quine's views were motivated by ontology. In their subsequent correspondence, Carnap dismissed Quine's syntactic objections as fallacious. In his replies it soon came out that Quine's real underlying reservations stemmed from his nominalistic sympathies. He objected to the idea that in modal contexts we quantify over concepts (Quine 1990, p. 326) and, after some debate, admitted that Carnap's view was coherent, but maintained that it implied an ontology of abstract intensions (Quine 1990, p. 371). In other words, intensional languages had ontological commitments which were an affront to his nominalist leanings. This point would subsequently make it into print a few years later, when Quine complained that 'modal logic is committed to an ontology which repudiates material objects' (Quine 1947, p. 47).

In this book Quine laid the groundwork for his distinction between the theory of meaning and the theory of reference. In 1934, he had lacked that distinction, but appeared to be grasping around in the dark in

search of it when he said: 'the sentence as a whole is to be taken as a verbal combination which, though presumably conveying some manner of intelligence (I write with deliberate vagueness at this point), yet does not have that particular kind of meaning which consists in denoting or being a name of something' (Quine 1934, p. 474). In 1939, he moved closer to the issue by deploying the mediaeval distinction between *categoremata* and *syncategoremata*, and making the distinction between understanding the meaning of a term and knowing its designatum. But in this book Quine added to the distinction between designation and meaning – 'only [names] designate, whereas perhaps all words and other more complex unities capable of figuring in statements have meaning' – the idea that meaning should be explained in terms of synonymy, which in turn 'calls for a definition or a criterion in psychological and linguistic terms'. At this point he had not yet written off the theory of meaning as inherently confused, as he was to do later. But he was beginning to draw a distinction between extensional semantic relations such as designation and satisfaction, and what he viewed as the more nebulous, psychologically-based type of meaning. In his first letter to Carnap upon his return from Brazil, he identified as the chief disagreement between them 'your failure to keep meaning distinct from designatum', claiming that that distinction would 'have obviated the seeming advantages ... of intensional contexts' (Quine 1990 p. 299). Again part of the motivation appears ontological, as well as epistemological and semantic. Quine was opposed to the intensional for ontological reasons. Talk of designation, truth-functions, and satisfaction may have been attractive to him because it is able to focus squarely on the two physicalistically acceptable levels of concrete designata and concrete utterances of statements, as long as we avoid impurely designative occurrences in which the two levels are confused.

### 7. *Philosophy of Logic and Mathematics*

Quine's evolving views on ontology, as well as his evolving views on meaning, are also key to understanding his account of philosophy of logic and mathematics in this book. For some years, he had been torn between his great admiration for *Principia Mathematica*, which says that all arithmetic is just logic abbreviated, and his distrust of the abstract objects posited by mathematics and therefore, according to *Principia*, by logic. Quine was dissatisfied both with the realism of Russell and Whitehead about such objects and with the deflationary solutions proposed by the members of the Vienna Circle, who took an anti-metaphysical stance or, appealing to the *Tractatus*, maintained that logical and mathematical truths are mere tautologies.

As a result it may strike us as odd to find Quine writing in the Introduction to *The Significance of the New Logic* that logicism is true, and subsequently declaring in the final section of the book that mathematical theories are mere tools, consisting of pseudo-statements which are not truly true or false. These claims are among the philosophical loose ends the book contains – Quine did not pick them up again upon his return to philosophy. Over the course of the forties he changed his mind on the issue, and he had moved away from the lines of thought expressed in this book by the time the war had ended.<sup>6</sup> But they are instructive from a

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<sup>6</sup> Although there is some resemblance here to the views expressed in Quine's joint paper with Goodman from 1947, which presents 'the sentences of mathematics merely as strings of marks without meaning', that paper justifies the

historical point of view, because they point to the influences other philosophers, especially Tarski, had on Quine at the time and reveal a gradual shift in his philosophical allegiance away from Carnap. When Quine began his PhD work in 1930, he might have supposed, for a hopeful year or so, that a kind of formalism would allow him to endorse the mathematical logic of *Principia* without its abstract ontology. Such a potential strategy is described in this book as identifying logical (and, assuming *Principia* is correct, mathematical) truth with provability (Quine 1944, p. 20). But Gödel's 1931 result established that such a formalist strategy is doomed to fail. In this book Quine presupposed (as he had in 1940, pp. 1-7) that any specification of logical truth will have an element of the semantic to it. Logically true statements are those which remain true under any substitutions of other terms for their non-logical terms – as Quine put it, those in which only logical vocabulary occurs essentially. That characterisation of logical truth still contains the term 'true', in 'remain true'. Such uses of 'true' or other semantic terms, e.g. 'occurring essentially', cannot be reduced to pure syntax or paraphrased away. Appeals to the purely formal, conventional, or notational features of expressions are, as Gödel had shown, insufficient to determine logical or mathematical truth. The formalist line seemed dead in the water to Quine. Yet his nominalist leanings meant that he continued to resist the abstract ontological commitments of the *Principia* system. In *The Significance of the New Logic* Quine deployed insights he derived from conversations with Tarski to forge a new kind of synthesis, if a rather uncomfortable one, between his dedication to mathematical logic and his desire for a parsimonious, concrete ontology. His appeal to the usefulness and pseudo-truth of mathematics can be viewed as a sort of instrumentalism about infinitistic mathematics.

In the Introduction to this book, Quine endorsed Tarski's conception of logic as 'the common denominator of the special sciences' (Quine 1944, p. 17). Elaborating on this idea, Quine characterised logic as a completely general science whose truths apply to any domain of objects. As becomes apparent only much later in the book, such a characterisation appears to render logic innocuous from a nominalistic point of view. If logic is the most general theory, compatible with the content of any special science (Quine 1944, p. 17), then it is equally compatible with theories which posit only a finite number of things. A tension between this conception of logic and that of *Principia* now comes into focus for us, although Quine waited until the end of the book to discuss it. The *Principia* system presupposes the Axiom of Infinity, and thus an infinite number of things in the universe. In 1941, of course, Tarski had vigorously maintained that that presupposition was intolerable. Quine had tended to agree with Tarski. Carnap, in his discussion notes, had attributed to Quine the idea that perhaps non-finitistic mathematics might stand to finitistic mathematics as observation sentences stand to theoretical physics (Carnap 2013 [1940-41], p. 150). A view with some similarities to that idea is sketched in the final section of *The Significance of the New Logic*. Quine proposed

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intelligibility of mathematics primarily based on the 'syntactical or metamathematical rules governing those marks' (Goodman and Quine 1947, p. 111). By contrast, this book invokes 'pseudo-truth' and appeals to more semantic and world-based considerations such as the utility of mathematics (Quine 1944, p. 235), i.e. the applications to natural science emphasised earlier on in the book (Quine 1944, p. 21).

that classical mathematics could not strictly speaking be held true, given Gödel's proof, but ought to be treated as a useful tool, yielding 'ideograms' which look and behave in most respects like statements (Quine 1944, p. 235). His mature philosophy of mathematics was, of course, rather different, abandoning both the logicist and the nominalistic tendencies he expressed in this book. Quine's early-forties philosophy of logic does have crucial similarities with his mature philosophy of logic, such as the conception of logical truths as those truths which remain true under all lexical substitutions (Quine 1970, p. xi). But he was to hold firm to the (Tarskian-inspired) philosophy of logic he put forward in *The Significance of the New Logic*, and this would lead Quine to abandon his logicist leanings.

Although Quine stated in the Introduction that logicism is true, he wavered on the question over the course of the book. Earlier on he described Russell's paradox, which involves sets or classes, as 'purely logical' (Quine 1944, p. 15) and called '(y) (z) (w) ~ ((x) xz > w • ~ yz > w)' a logical truth (Quine 1944, p. 95). But towards the end of the book we see him slide from his former characterisation of logic as the theory whose truths apply to any domain of objects to a characterisation according to which logic is the theory without its own bespoke ontology. We might have expected to find him describing the theory of classes as something other than logic because logic does, but the theory of classes does not, apply to absolutely any domain of objects, since certain classes cannot belong to classes (Quine 1944 p. 193). Instead, Quine's argument is that the theory of classes comes with a vast, abstract ontology. 'The theory of classes, in contrast with logic in the strict sense, implies an ontology. It does not imply an exclusive ontology, as it imposes no restrictions on the type of objects remaining, the so-called "individuals"; but it implies a positive ontology of classes. This implication of an ontology of abstract objects is, although indispensable to classical mathematics, repugnant to many thinkers' (Quine 1944, pp. 190-191). The theory of classes, then, belongs not to logic, but to mathematics. But Quine's virtual theory of classes comes to his rescue, allowing logic in the strict sense to do a substantial part of the work generally assigned to the theory of classes, while still avoiding any special logical ontology. Only certain parts of mathematics can be tamed in this way. The virtual theory is not strong enough to legitimate all of classical mathematics.

*The Significance of the New Logic* ends with a description of Gödel's proof and Quine's estimation of its philosophical significance. Again, Quine stressed that the proof entailed that neither logical nor mathematical truth could be taken to consist in provability. 'No formulation of the notion of theorem can cover all of the true statements that can be formulated even in this very restricted notation of elementary arithmetic, without also covering false statements. The same is true *a fortiori* for our logical notation, since it is capable of expressing arithmetic and much more.' (Quine 1944, p. 234). He pointed out that even the potential infinite is affected by this problem. (Carnap's notes from the previous year reveal that both Quine and Tarski had qualms about the potential infinite and Carnap's reliance on a notion of possibility (Carnap 2013 [1940-41], p. 157).) Quine then described the upshot of Gödel's proof as a 'victory for those who obstinately refuse to recognize abstract objects' (Quine 1944, p. 234), because, he claimed, it points to a

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conception of mathematics as a useful tool 'without content in the full sense' (Quine 1944, p. 235).<sup>7</sup> Instead of a theory composed of true or false statements, mathematics draws 'ideograms [which] behave as though they have meaning [because of our] use of the methods of the theory of quantification (whose meaning still remains unquestioned) in deriving theorems from the axioms we assume' (Quine 1944, p. 235). The book, then, ends on a note best described as a kind of instrumentalism about classical mathematics. Mathematics is justified by its usefulness, presumably the 'fruitful applications to the natural sciences' he had invoked earlier in the book (Quine 1944, p. 16). But the statements of classical mathematics, which presuppose infinite ranges of abstract objects, are not taken to truly (or falsely) describe anything of an abstract nature. As he grew out of his finitistic and nominalistic inclinations, Quine swore off the instrumentalist treatment of mathematics. Still, there are some points of contact with his mature philosophy. Although Quine's later indispensability arguments do admit the existence of abstract, mathematical posits, their justification still invokes their usefulness to the natural sciences – specifically, to physics. The mature Quine no longer abjured the literal truth of classical or infinitistic mathematics generally. Accordingly, his nominalistic leanings of the 1930s and '40s had dropped away. Nevertheless, even in his later period he held firm to the idea that higher set theory, which has no applications, is merely recreational (Quine 1986b, p. 400).

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<sup>7</sup> Greg Frost-Arnold points out that there is a close resemblance here to a view expressed by Tarski in 1941 (Carnap 2013 [1940-41], p. 153.)

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