For the *Metascience* symposium on *Carnap, Tarski, and Quine at Harvard*:

Replies to Creath, Ebbs, and Lavers

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**1. Introduction/ Précis**

Rudolf Carnap, Alfred Tarski, and W. V. Quine spent the academic year 1940-41 together at Harvard. They frequently met to discuss topics of shared interest concerning philosophy and logic. Carnap took dictation notes in many of these meetings, and these notes are stored in the Carnap Archive. Highlights of these notes appear in Paolo Mancosu’s (2004), and the notes in their entirety comprise the appendix to my *Carnap, Tarski, and Quine at Harvard*, which is the focus of this symposium. I feel truly honored to have outstanding scholars engaging with the material in this book. Before addressing their comments in detail, I offer a brief overview of the notes.

Since these conversations were informal, the participants discussed whatever struck their fancy that day. Thus, the conversations span a wide range of topics. Nonetheless, the theme that recurs most often is the project, originally proposed by Tarski, of constructing what the discussants called a ‘finitist’ and/or ‘nominalist’ language of (natural) science. Since Creath, Ebbs, and Lavers all address this part of the 1940-41 conversations, I will outline the key features of this project.

What is a Finitist-Nominalist (FN) language? It is any language that has the following four features: (1) it is first-order, (2) the domain of discourse can only contain concrete objects, (3) no assumption is made about the cardinality of the domain of discourse, and (4) there are only finitely many non-logical, undefined predicates. The first two are nominalist strictures: because it is first-order, one cannot quantify over properties, and because the domain can only contain concreta, one cannot quantify over numbers or classes (conceived of as abstracta). As a result, numerals must refer to physical objects (if anything). Conditions (3) and (4) are obviously finitist.

But, one may wonder, what is the point of imposing such strict constraints on a language? Tarski, who proposes the project, says that he “only understands a language meeting” these four conditions; he ‘understands’ other languages only in the way one understands a formal, empty calculus (Frost-Arnold 2013, p.153). And the notes return repeatedly to understandability or intelligibility [*Verständlichkeit*] as the fundamental motivation for imposing the FN conditions. The obvious next question is: what do the discussants mean by this term? Unfortunately, they almost never discuss intelligibility itself, even though the notion is at the heart of their finitist-nominalist project.

**2. Creath, “Understandability”**

According to Creath, to understand a linguistic expression is, in one important sense, to know its role in a system of rules. Creath calls this an idealization; however, I want to argue that this is an *over*-idealization, i.e. this characterization leaves out something necessary for Carnapian understanding. Put otherwise: this characterization of understanding is adequate only when certain further conditions are met. I will bracket natural languages here, as Creath does (MS\* p.9). So let us turn to understanding the expressions of an artificial language via their roles in the language’s system of rules. Specifically, Creath says “the transformation rules of logical syntax… can be fitted into… such a notion of understanding” (MS\* p.8). (Transformation rules are, in a natural deduction system, the introduction and elimination rules, plus any axioms.)

I think this is an over-idealization: the formation and transformation rules that define a language in Carnap’s *Logical Syntax of Language* do not suffice for understanding, according to Carnap, even during Carnap’s syntactic phase. Why? Because these rules cannot, by themselves, avoid what we could call the ‘teavy problem’ (following “Overcoming Metaphysics through the Logical Analysis of Language” (1932/1959, p.64)), or the ‘entelechy problem’ (1934/1937, p.319), a problem that prefigures Searle’s Chinese Room argument. This problem is that merely knowing the formation and transformation rules governing a linguistic expression does not guarantee that expression has a meaning, for there can be a rule-governed system comprised entirely of meaningless marks or sounds, such as ‘teavy.’ And as Creath holds, meaningless expressions cannot be understood. Such a “freely floating system” (Carnap 1963, 78) of formation and transformation rules only becomes meaningful by entering into (non-trivial) logical relationships with meaningful expressions; and the paradigm case of sub-sentential meaningful expressions are observational terms. Even in *Logical Syntax*, Carnap holds that mathematical expressions become genuinely meaningful instead of empty formalism by standing in inferential relationships with the rest of our language, which includes empirical claims: “the meaning of the mathematical symbols is established… by *the inclusion of the mathematical calculus in the total language*” (1934/1937, p.326-327), where ‘the total language’ includes everyday and scientific vocabularies.

One might think that switching from syntactic to semantic characterizations of language could solve this problem for treating understanding as knowing an expression’s place in a system of rules. I do not think so. When Carnap specifies a language via semantic rules instead of only syntactic (formation and transformation) ones, this specification always presupposes an antecedently understood metalanguage, into which the object language expressions are translated (*Foundations of Logic and Mathematics* and *Introduction to Semantics* are examples of this). So also in the case of semantic rules, there is an originally understood language, in which the rules characterizing the object language are stated—but we cannot use Creath’s ‘system-of-rules’ proposal to capture what makes that originally understood language understandable, since we can imagine a situation where both the object language and the metalanguage are teavy-like. In such a case, the semantic rules would not yield understanding.

Consider further evidence that even *Syntax*-eraCarnap thinks the formal rules alone are insufficient for understanding: “When only the formal rules of a language… are known, then, although it is possible to answer syntactical questions concerning it… it is not possible to use it as a language of communication” (1934/1937, p.227). And presumably, if a ‘language’ cannot be used for communication, then it is not understandable, since what a hearer understands is what the speaker is trying to communicate.

In sum, Creath’s proposal that understanding is knowing a role in a system of rules needs to be restricted: the system of rules must include some understandable (and thus meaningful) expressions. So a set of formation and transformation rules does not guarantee understandability, and neither would a set of semantic rules stated in a metalanguage that was not antecedently understood. We need some ‘originally’ meaningful, understandable expressions somewhere—and this proposal does not provide a way to determine whether any of those originals are present.

Finally, I think this also matters for Creath’s closing historiographical point. If all that is necessary to understand a historical figure is knowing how each ‘foreign’ historical term is inferentially related to all the other historical terms, then historians can fall prey to an *illusion* of understanding. That is, they can deceive themselves (and others) into believing they understand a historical text, when they are actually merely inferentially connecting a set of ‘teavy’-like (for us moderns) historical expressions the historical authors used.

**3. Ebbs, “Quine’s ‘Predilection’ for Finitism”**

Gary Ebbs’ contribution also aims to help us grasp the notion of intelligibility in play in the Harvard conversations, focusing on Quine’s conception of it. For Quine, ‘intelligible’ appears roughly equivalent to ‘clear,’ as shown by a 1947 letter Ebbs cites: “In my own predilection for an exclusively concrete ontology, there is something which does not reduce in any obvious way to considerations of mere convenience; viz., some vague but seemingly ultimate standard of intelligibility or clarity” (Creath 1990, 410). The heart of Ebbs’ interpretation of Quine’s conception of intelligibility is this: to say that a FN ontology is clearer or more intelligible than other ontologies means that that a FN ontology is *closer to common sense* than other ontologies (and thus more explanatory). In Ebbs’ words: “Quine views this ‘seemingly ultimate standard’ as of a piece with ‘controls of common sense’ that are integral to scientific method” (MS\* p.5). Ebbs’ proposal is innovative and well worth pursuing, especially since intelligibility is such a crucial yet under-theorized concept in these 1940-41 discussions. In what follows, I raise two concerns for this interpretation of Quinean intelligibility.

First, a quotation from “Two Dogmas” that Ebbs cites (MS\* p.3) appears to be evidence against the claim that the austerity of the FN conditions are closer to common sense. Quine says that “[s]cience is a continuation of common sense, and it continues the *common-sense expedient of swelling ontology* to simplify theory” (1953, 45; my emphasis). The emphasized text suggests that Quine does not think common sense favors the sparse FN ontology, since avoiding the complications created by FN strictures is a major motivation for the ‘swollen ontology’ of classical mathematics over finitist-nominalist mathematics (1976, 261). Quine distinguishes theoretical and ontological simplicity (1960, 243); nominalism is somewhat ontologically simpler than realism about classes, but it is much more theoretically complicated.[[1]](#footnote-1) Additionally, one might hesitate in saying that Quine held that common sense favors any ontology, since that Quine claims that rarified ontological doctrines are not part of common sense. “Ontological concern is not a correction of lay thought and practice; it is foreign to the lay culture” (1981, p.9).

Here is the second concern. Ebbs presents Quine as holding that all inquiry (including Quine’s own inquiry into nominalism) as pursuing two distinct goals: (1) economy and (2) adherence to the controls of common sense (MS\* p.3). But is common sense a separate criterion, over and above the theoretical criteria of economy (and other theoretical virtues)? Or can the facts about Quine’s texts that Ebbs explains via appeal to common sense instead be explained via simplicity (and other theoretical virtues[[2]](#footnote-2)) alone, without positing a separate criterion of common-sensicality? I will give three reasons in favor of the latter option. First, as we saw in the quotation from “Two Dogmas” above, Quine elaborates upon his assertion that ‘science is a continuation of common sense’ by explaining that common sense aims ‘to *simplify* theory.’ So the drive to simplify is part of common sense here, not a distinct concern. Second, since Quine says that science does *not* replace common sense, but is rather a “continuation” of it, one natural reading is that the drive for simplicity is part of common sense, instead of common sense being a distinct criterion. So here is an alternative to Ebbs’ picture: common sense is not one component goal of the overall project of science amongst other goals like simplicity and consistency with observation, but rather it is the temporal ancestor of the whole enterprise. Third, we can explain why Quine says (as Ebbs cites) that nominalism “would be my actual position if I could make a go of it” (cited in MS\* p.5), without appealing to common sense—simplicity suffices. Quine says nominalism is appealing because of its (ontological) simplicity: not only does it reduce the number of individual entities we must accept, but it also eliminates a “dualism of categories” (1960, 268), i.e. the categories of both physical objects and abstract classes. So in terms of both the individual objects and the basic properties, nominalism is more economical—no appeal to common sense is required. In short, the ‘controls of common sense’ need not be seen as distinct from the drive for simplicity, or other theoretical virtues.

**4. Lavers, “Carnap’s Surprising Views on the Axiom of Infinity”**

Lavers focuses on the finitist part of the finitist-nominalist project. Lavers raises a clear “dilemma” for Carnap’s views about the axiom of infinity, specifically, Carnap’s self-described attempts to find an interpretation of the axiom of infinity that makes it analytic. In what follows, I will offer a way out of Lavers’ dilemma for Carnap. However, I believe Carnap does fall prey to a closely related problem—and other scholarship by Lavers provides the resources needed to pose this related problem.

Lavers sets up the dilemma as follows. Following the terminology in Lavers’ contribution, let us call the assignment of positions, instead of objects, to the values of (first-order) variables Carnap’s ‘material interpretation’ of the axiom of infinity. (1) If the material interpretation is “doing some important epistemological work,” then “the axiom is synthetic.” (2) If the material interpretation is “not really doing any serious epistemic work,” then it is “superfluous.” Therefore, the (interpreted) axiom is either synthetic or superfluous—but Carnap does not want it to be either (MS\* p.4).

I think (1) can be resisted, because important epistemological work can be done by analytic claims (assuming analytic truths exist, as Carnap of course does). For example, any mathematical proof will proceed via analytic truths. And presumably, sophisticated mathematical proofs count as ‘important epistemological work.’ But let us imagine someone denies this, presumably on the grounds that analytic sentences do not make any claims about how the world is, and/or that a proof merely makes explicit information already implicitly contained in the premises. Then, important epistemological work can only be done via synthetic claims. However, if we read this meaning of ‘important epistemological work’ into premise (2), then (2) becomes untenable, unless we accept that all of logic and mathematics is superfluous—which is very implausible. In short, I think a Carnapian could escape Lavers’ dilemma by pointing out that the analytic truths of logic and mathematics do important epistemological work; and even if one denies that mathematical proofs are ‘important epistemological work,’ they are, at least, not ‘superfluous.’

Nonetheless, I think Carnap’s attempt to make the axiom of infinity analytic by interpreting the individuals as positions (instead of objects) can still be shown to be problematic. In his other work, Lavers provides some of the key insights needed to pose this related problem. Analytic truths, according to Carnap, are independent of empirical matters of fact; however, there are reasons to think that this positional interpretation of the axiom of infinity is *not* independent of empirical knowledge. As Lavers says in (*forthcoming*): if the individual names “stand for positions in some intuitive sense, then the axiom of infinity would assert the existence of infinitely many such positions. This would still be an empirical claim whether or not there was anything to be found at these positions” (§2). Certain types of scenarios discussed in the 1940-41 notes support this claim vividly and concretely. For example, if spacetime were both (i) discrete or quantized and (ii) circular or otherwise finite in extent, then there would *not* be an infinite number of spatiotemporal ‘atoms’ or indivisibles (Frost-Arnold 2013, 46-7, 164). Thus, there would be a finite number of positions, and thus, in this imagined circumstance, the axiom of infinity would be false on a position-based interpretation. Since, on this interpretation, certain states of affairs would falsify the axiom of infinity, the axiom would be synthetic.

One might defend Carnap as follows: I have misinterpreted ‘position.’ Carnap must have in mind some other, more abstract sense of ‘position,’ perhaps of a position in an arbitrary linear progression. For example, when Carnap is defending the analyticity of the axiom of infinity in the 1940-41 discussions, Carnap says “the possibility always exists of taking another step in forming the number series” (Frost-Arnold 2013, 58); positions should be understood as (like) these ‘next steps.’ However, this defense of the position-based interpretation’s analyticity is inadequate. First, recall that Carnap believes that both logical and descriptive interpretations of the Peano axioms are possible (1939, 181). This ‘possibility of another step’ interpretation sounds closer to a logical interpretation than a descriptive one; and if it were descriptive, it threatens to fall into psychologism: it would depend on humans’ psychological ability to always ‘add one,’ no matter how large the starting point. Second, more decisively, the positions Carnap talks about in this interpretation of the axiom of infinity are positions *where physical objects could be located* (1934/1937, §38a). So those positions have to be physical themselves, since a physical body can only be located in a physical place. As Lavers says in (*forthcoming*), in *Logical Syntax*, “Carnap interprets positions as locations in some intuitive sense” (§2). In short, the positions in Carnap’s position-based interpretation of the axiom of infinity are empirical positions, so even if the actual world does not have a finite number of positions, it is an empirical fact that it does not have this spatiotemporal structure; thus, the position-based interpretation cannot make the axiom of infinity analytic. Therefore, I think Lavers’ concern that the position-based interpretation does not make the axiom of infinity analytic is justified, although I demur from his reasons for this conclusion offered in this symposium.

**REFERENCES**

Carnap, Rudolf (1932/1959). “Elimination of Metaphysics through the Logical Analysis of Language,” in *Logical Positivism*, A. J. Ayer (ed.). New York: Free Press, 60-81.

Carnap, Rudolf (1934/1937). *Logical Syntax of Language*, A. Smeaton (trans.). Chicago: Open Court.

Carnap, Rudolf (1939). “Foundations of Logic and Mathematics,” in *International Encyclopedia of Unified Science*, O. Neurath, R. Carnap, and C. Morris (eds.). Chicago: University of Chicago Press, 139-214.

Carnap, Rudolf (1963). “Intellectual Autobiography,” in *The Philosophy of Rudolf Carnap*, P. Schilpp (ed.). LaSalle: Open Court.

Creath, Richard (1990). *Dear Carnap, Dear Van*. Berkeley: University of California.

Frost-Arnold, Greg (2013). *Carnap, Tarski, and Quine at Harvard*. Chicago: Open Court.

Lavers, Gregory (*forthcoming*). “Carnap on Abstract and Theoretical Entities,” in *Ontology After Carnap*, Blatti and Lapointe (eds.). New York: Oxford University Press.

Mancosu, Paolo (2004). “Harvard 1940-41: Carnap, Tarski and Quine on a Finitistic Language of Mathematics for Science,” *History and Philosophy of Logic* **26**: 327-357.

Quine, W. V. (1953). “Two Dogmas of Empiricism,” in *From a Logical Point of View*. Cambridge: Harvard University Press.

Quine, W. V. (1960). *Word and Object*. Cambridge: MIT Press.

Quine, W. V. (1976). *The Ways of Paradox and Other Essays*. Cambridge: Harvard University Press.

Quine, W. V. (1981). *Theories and Things*. Cambridge: Harvard University Press.

Quine, W. V. (1990) *Pursuit of Truth*. Cambridge: Harvard University Press.

1. Quine thinks a balance must be struck between the two types: “Simplicity is the thing, and ontological economy is one aspect of it, to be averaged in with the others” (1976, 264). [↑](#footnote-ref-1)
2. Quine lists five virtues in a hypothesis: “conservatism, generality, simplicity, refutability, and modesty” (1990, 20). Perhaps Ebbs’ position is—or should be—that ‘common sense’ is roughly equivalent to one or more of these (conservatism is probably the best candidate, but that encompasses familiar scientific theories in addition to common sense, for Quine). [↑](#footnote-ref-2)