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CARNAP ON TRUTH

During his long career, Rudolf Carnap held various different views about the concept of truth and its philosophical significance. As a good logical empiricist, he insisted on the distinction between logical and factual statements, and employed his technical powers to give rigorous characterizations of the notions of logical, analytic, and factual truth. The development of Carnap's views reflected his ability to quickly absorb new influences and his broad interests ranging from logic to epistemology, philosophy of language, and philosophy of science (Sections 1 and 2). Carnap was the co-founder of logical semantics with Alfred Tarski (Section 3), and therefore it is especially interesting to see how Carnap's work was related to Tarski's early definition of truth and to the later Tarskian model theory (Section 4). In Section 5, we discuss some difficulties in Carnap's liberally empiricist treatment of scientific theories. The final section 6 makes some remarks on Carnap's contemporary relevance.

I. CARNAP'S EARLY WORK

For the purposes of our survey, the first period of Carnap's work can be taken to cover his early development until the end of the 1920s. During this time, unlike some of his associates in Vienna (Moritz Schlick) and Berlin (Hans Reichenbach), Carnap did not show any particular interest in the classical philosophical debates on the notion of truth.¹

Carnap's education had three important components. One was his study of contemporary developments in mathematics and physics, including philosophical commentaries written by positivists (Ernst Mach) and conventionalists (Henri Poincaré, Hugo Dingler). The second was mathematical logic, introduced to him in 1910–14 by Gottlob Frege in Jena. The third was the influence of his Neo-Kantian teachers of philosophy.

The Neo-Kantian programme of the Marburg school attempted to modify Kantian approaches in order to make them compatible with the latest achievements of mathematics and physics, such as non-Euclidean geometries and the theory of relativity. This outlook still dominated Carnap's 1922 doctoral dissertation *Der Raum*, which claimed that the topological structure of geometry is based upon pure intuition and, therefore, synthetic *a priori*.

However, the works of Frege and Bertrand Russell soon convinced Carnap of the logistic view that mathematics is reducible to logic and, hence, analytic and *a priori*. But, with Reichenbach, Carnap accepted the idea that the *a priori* element of science has to be relativized to theoretical frameworks.

The reading of Russell's *Our Knowledge of the External World* in the winter of 1921 assured Carnap of the importance of logic as the method of philosophy. By 1924 he finished a manuscript "Vom Chaos zur Wirklichkeit" which applied Russell's type theory from *Principia Mathematica* to the Kantian problem about the constitution of the world. After moving to Vienna in 1926, Carnap eventually published this grandiose work in 1928 with the title *Der Logische Aufbau der Welt*.

Recent scholarship has emphasized the neo-Kantian motives in Carnap's *Aufbau*.² His choice of the "autopsychological" *Elementarerlebnisse* as the basis of the constitution, and thereby his way of treating physical objects and other minds as "logical constructs" in Russell's sense, links his views also to Mach's phenomenalism. Discussions about *Aufbau* in Schlick's circle in Vienna promoted a phenomenalist reading of Ludwig Wittgenstein's *Tractatus Logico-Philosophicus* (1922) which had left open the nature of its "elements."

Carnap's constitution system can be read as a rational reconstruction of the path of human concept formation and knowledge from "the given" to more complex domains of science.³ This epistemological reading is compatible with Carnap's very strict exclusion of questions of ontology as bad metaphysics: the choice of the basis is a matter of choosing a language, and the construction process proceeds from terms to other terms via explicit definitions. Appealing to Wittgenstein, Carnap argued that the task of philosophy is to analyse language. In his *Scheinprobleme in der Philosophie* in 1928, he warned against the dangerous "pseudo-problems" that arise in philosophy from the careless use of statements without factual or experiential content. Here the strict criterion of meaningfulness of the *Aufbau* (i.e. constructibility in the phenomenalist constitution system) was replaced by a more liberal condition requiring that there is conceivable empirical evidence which deductively or inductively supports a statement or its negation.⁴

Among the meaningless pseudo-problems Carnap included the issue of realism, i.e. the question of the existence of "an external world" independent from the cognizing consciousness. Likewise, questions about the relations of language to extra-linguistic reality were counted as metaphysical. Indeed, in his "Intellectual Autobiography" (1963), Carnap told that the Vienna Circle read Wittgenstein's *Tractatus* as claiming that "the logical structure of sentences and the relation between language and the world" are things that "show themselves but cannot be said."⁵ In other words, this amounts to the ineffability of syntax and semantics, confirming Jaakko Hintikka's thesis that Frege, Russell, and Wittgenstein – and the young Carnap in their footsteps – advocated the universal medium view of logic and language.⁶

It is thus no wonder that, in this period, Carnap did not actively analyse the concept of truth. In the *Aufbau* (sec. 44), Carnap followed Frege in taking truth value to be “the nominatum of a sentence,”⁷ and he hinted that the meaning of a sign depends on the “truth-criteria” for the sentences where the sign can occur (sec. 161). In his work on symbolic logic, influenced by Frege and Russell, especially in the textbook *Abriss der Logistik* (1929), “true” and “false” appear as undefined primitive notions whose meaning can be clarified by truth tables.⁸

II. PHYSICALISM AND LOGICAL SYNTAX

A new twist in Carnap’s thinking can be seen in a manuscript “Untersuchungen zur allgemeinen Axiomatik,” written in 1928–1929.⁹ There he studied the notions of consistency and completeness that are central to David Hilbert’s programme of metamathematics. Let AS be an axiom system consisting of a formula $f(R, S, T)$ with free variables R, S , and T . Then the mathematical relations (R', S', T') , definable as constants in the language of *Principia Mathematica* (PM), constitute a “model” of AS if $f(R', S', T')$ is “true.” AS is “satisfied” if it has a model, and otherwise “empty.” AS is “inconsistent” if it has a contradictory consequence. Other concepts defined by Carnap’s manuscript include isomorphism, monomorphic (i.e. categorical) and decidable (i.e. complete). Further, Carnap proved that an axiom system is inconsistent if and only if it is empty. Carnap’s student Kurt Gödel, in his 1929 paper on the completeness of first-order logic, obviously referred to this manuscript, when he gave credit to Carnap’s unpublished manuscript which for the first time shows that consistency implies the existence of a model.¹⁰ But it was Gödel’s incompleteness theorem (announced in 1930) that refuted Carnap’s *Gabelbarkeitssatz* which claimed that categorical theories are syntactically complete.

As J. Alberto Coffa argued, Carnap’s discussion of axiomatic theories in 1928 was entirely confined to the “Russellian monolinguistic project,” in opposition to Hilbert’s two-language approach. There is no distinction between object language and metalanguage, and therefore one may agree with Coffa’s conclusion that Carnap’s tools and treatment were inadequate for capturing syntactic and semantic metamathematical notions. But otherwise Carnap can be praised for his early attempt to develop model theory within Russellian type theory, as an alternative to the later set-theoretic approach of Tarski. The ambiguity that Coffa pointed out between assuming that the emptiness of AS is “true” (in some absolutist sense) or “a theorem of PM” (in some proof-theoretic or constructive sense) can be repeated in the set-theoretic framework: is the claim that a sentence has a model “true” or “provable in ZF”?

Carnap met Alfred Tarski for the first time in Vienna in February 1930, and visited Warsaw later in the same year.¹¹ From Tarski Carnap learned

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