

In Carnap's Defense: A survey on the concept of a linguistic framework in Carnap's philosophy

Parzhad Torfehnezhad

Département de Philosophie
Université de Montréal
Pavillon 2910, boul. Édouard-Montpetit
Montréal, QC, H3C 3J7, Canada
parzhad.torfeh-nezhad@umontreal.ca

Abstract

The main task in this paper is to detail and investigate Carnap's conception of a "linguistic framework" (LF). On this basis, we will see whether Carnap's dichotomies, such as the analytic-synthetic distinction, are to be construed as absolute/fundamental dichotomies or merely as relative dichotomies. I argue for a novel interpretation of Carnap's conception of a LF and, on that basis, will show that, according to Carnap, all the dichotomies to be discussed are relative dichotomies; they depend on conventional decisions concerning the logical syntax of LF. Thus, all of the dichotomies directly hinge on the conception of the LF. The LF's logical structure, in turn, is an immediate consequence of adopting the linguistic doctrine of logical truths. As we will see, no appeal to any of these distinctions is necessary in establishing a LF and all of its components. I will also draw attention to the differences between what Carnap labels a "way of speaking", "language", and "artificial language". Consequently, I will briefly conclude that none of Quine's major objections address the main points of Carnap's theory.

1 Introduction

The Quine-Carnap debate is one of the most well-known debates in the history of modern philosophy. For Carnap, ontological questions like "Is/are there so and so?" are meaningless if they are questions external to what he calls a "linguistic framework" (henceforth LF). In other words, Carnap believes meaningful ontological questions, in general, can only be asked from inside an adopted LF (Carnap, 1950: 914–915). Quine, on the other hand, does not distinguish between external and internal questions. He argues that this distinction is only based on the old, fundamental (absolute) analytic-synthetic distinction. The latter, on Quine's view, is both wrong and useless (Quine, 1951: 43).

In the literature, numerous scholars and commentators devoted at least a portion of their work to reflect on, or discuss, the Quine-Carnap dispute. Some, from among those who defended Carnap's position, think that it is immune from Quine's criticism if one properly analyses the relationships between Carnap's dichotomies. By appealing to what he calls a "metaphorical-literal distinction", Yablo, for example, claims that the association of the internal-external distinction with analytic-synthetic distinction (henceforth ASD) can be freed and shown to be a "non-committal figurative speech", so that even Quine cannot argue against it (Yablo, 1998: 232–233). Similarly, Bird thinks Quine misses Carnap's central points by failing to appreciate the "four-folded" distinction underlying Carnap's internal-external distinction (Bird, 1995).

Some philosophers argue that Quine is equally guilty of the same charge of which he accuses Carnap. Berge (Berge, 1995) rejects Quine's criticism on the basis that his view on reference is quite similar to that of Carnap's. In addition, Burgess (Burgess, 2004) believes that although Quine is right to argue that the internal-external distinction is based on the ASD, he inevitably needs something similar to explain the obviousness of elementary mathematics. Similarly, Koellner (Koellner, preprint), in the context of mathematical truth, fairly defends and justifies Carnap's view on analyticity and mathematical pluralism.

Some do not question the fundamentality of the ASD, but they take the distinction to be representative of other, deeper distinctions. O'Grady (O'Grady, 1999) shows how some scholars mistakenly evaluated Carnap's position. Nevertheless, he appreciates that the dispute could be understood as a dispute about deeper philosophical methods. Also, Lavers (Lavers, 2012) argues that the Quine-Carnap dispute on analyticity stems from their different views on what constitutes a successful explication.

Furthermore, there are philosophers who argue that Carnap's neutral ontological position is achievable via some modifications. Friedman (Friedman, 2009), for example, argues that if Carnap's scientific theory is understood in conjunction with Ramsey's sentences, the neutrality of Carnap's ontological position can be restored. Others, like Grice and Strawson (Grice, 1956), argue that Quine's criticism is simply not sufficient to reject the ASD.

Some philosophers take a different approach altogether. They tend to evaluate Carnap's general philosophy of science without engaging the debate about the dichotomies directly. Interpreting Carnap as an instrumentalist, Howard Stein (Stein, 1989) discusses the legitimacy, importance, and productivity of both realism and instrumentalism from the perspective of history and philosophy of science. He then evaluates the debate as a productive example of a realist-instrumentalist debate. On the other hand, Hintikka (Hintikka, 1992) believes that focusing on Carnap's dichotomies would not be helpful in illuminating the real problem about the general dynamics of Carnap's thoughts. Hintikka argued that although it may appear to be the case that Carnap takes language as a calculus, he actually maintains the idea of the universality of language, and does not regard language as a mere calculus. This, for Hintikka, is the main problem.¹

As we have seen in all of the above-mentioned examples, one of the questions that has not received enough attention is the question of whether these dichotomies are treated as fundamental (absolute) or relative. Is the ASD or internal-external distinction, regardless of their relation to each other, understood by Carnap to be *fundamental/absolute* distinctions? Or are they treated by Carnap as *relative* distinctions that are decidable only after we adopt a particular LF? In other words, is it akin to the relative distinction between east and west after we agree on the particular geographic region in question, or to the absolute distinction between "to be" and "not to be"? One of the main questions in this paper concerns whether these dichotomies are understood absolutely, i. e., whether they are treated as fundamental dichotomies. To this question, I will answer in the negative. Consistent with the given interpretation of LF in this paper, I will argue that, according to Carnap, all the mentioned dichotomies are *relative* dichotomies. They turn on our conventional decision concerning the logical syntax of the LF. The conception of all dichotomies directly hinge upon the conception of the LF, and the LF's

¹The mentioned references are only few examples of a large literature on this topic. Although listing and discussing all of them is neither possible nor intended in this paper, here are some other examples that one may want to consult: (Price, 2009), (Price, 1997), (Psillos, 2000), (Hillier, 2009), (George, 2000), (Akiba, 1995), (Sober & Hylton, 2000), (McDermott, 2001), (Hempel, 1973), (Psillos, 2000), (Oberdan, 1992), (Haack, 1993), (Tsou, 2003), (Peacock, 2011), (Arnold & Shapiro, 2007), (Soames, 2009), (Friedman, 2000), (Friedman & Creath, 2007), (Friedman, 1999), (A. W. Richardson, 2003), (A. Richardson, 2007), (Awodey, 2007).

logical structure, in turn, is an immediate consequence of adopting the linguistic doctrine of logical truths.

As we will see, no appeal to any of these distinctions is necessary to establish a LF and all of its components. In my view, all the distinctions become immediate simply by accepting that there is such a thing as a LF as described by Carnap. The term "LF" has been used by Rudolf Carnap in his famous paper "Empiricism, Semantics and Ontology" (Carnap, 1950) (henceforth ESO), and he has rarely used it elsewhere. This fact, in my view, caused many misinterpretations of Carnap's and his critics' understanding of the term. Though I will highlight some of these seemingly wrong interpretations, the goal of this paper is not to criticize them. Instead, I will present the interpretation of the term "LF" by scrutinizing some of Carnap's works other than ESO and especially his contribution to the "Encyclopaedia of Unified Sciences" in 1939 (Carnap, 1939). This may lead to a consensus on what Carnap means by a LF.

In short, I will generally characterize Carnap's conception of a LF as a factual-conventional hierarchy of assertions (or strings of signs) that is subjected to certain rules for delivering meaning. The rules could primarily be constructed (or recognized) from purely factual statements up to the purely conventional statements, and could equally be constructed the other way around, i. e., from purely conventional statements of a calculus down to purely factual statements of a newly interpreted language.

In section two, I will describe the grounds upon which language became a central point in Carnap's philosophy. Following this, I will briefly discuss the development of his conception of language, from his view in *Aufbau* (Carnap, 1967)² to his view in ESO (Carnap, 1950). Of course, in this section, my only concern will be Carnap's conception of language relative to his position on logic. This section will help us have a better idea of the basis upon which the "Linguistic Doctrine of Logical Truths" (i. e., logical truths are true by linguistic convention; henceforth LD) was adopted. As we will see, in Carnap's former view, logic is regarded as a representative system directly attached to our explanations of the world. According to this view one may conclude that the world, as we explain it, should have an underlying logical structure. But in Carnap's later view, he notices and legitimizes some sort of invention (in the form of conventions) in the middle of the former process of investigating (or constructing) logical forms of factual statements. By adding the conventionality factor to his theory, Carnap diverges from Wittgenstein. Therefore, the supposed "logical structure of the world" could no longer be the mirror image of the structure of the world. Later on, we will see how Carnap thinks this slight modification makes room for the equally legitimate concept of what is now known as an artificial language (as opposed to a natural language).

In the next section, the hierarchy of abstractions will be presented. There, I will clarify Carnap's later position about language by summarizing Carnap's "Foundations of Logic and Mathematics" (Carnap, 1939) and his views on the way to construct a language system and perform a linguistic analysis. In this section, I will present what Carnap calls a "language system" which, in my view, essentially bears no difference with what he later calls a LF in ESO.

In section four, I will give a detailed explanation of Carnap's two methods for constructing language systems. We will also see the basis of two possible and yet different changes in a

²Originally published as "*Der logische Aufbau der Welt*", Berlin, Benary, 1928. Although conventionalism is present in the *Aufbau*, some scholars believe Carnap is not explicit about this concept there (Runggaldier, 1984: 11).

framework parallel to the applications of these methods: the one that does not alter the logical fabric of the framework, and the one that does.

In section five, we will see how changes could basically be introduced at different levels of abstraction in order to produce moderately or radically different frameworks. In this section we will see what it means to have an “artificial language” as opposed to having different “ways of speaking”.

In section six, I will turn to Quine’s objection after clarifying Carnap’s conception of analyticity in light of what I argue in the previous sections. According to the given explanations, one may realize how Quine’s major objections miss the main points of Carnap’s theory. I will also argue that, as far as it concerns Carnap’s first method, Quine and Carnap are in complete agreement. The disagreement appears only where Carnap considers his second method to be as legitimate as his first. Quine, on the other hand, completely rejects this idea. He argues that the difference between natural and artificial languages (as well as the difference between external and internal questions to a LF) can only be established upon the acceptance of the useless ASD. I will argue that both distinctions directly hinge upon the conception of a LF, which in turn, is immediate by accepting LD.

I will then conclude that Carnap’s conception of a LF is immediate and unobjectionable following the admission of LD. Moreover, Carnap’s distinctions cannot be construed as absolute distinctions. I also show that Carnap’s model for language analysis is more fruitful and constructive compared to Quine’s. The latter, on my view, is more in accordance with traditional ways of thinking about philosophical problems.

2 Historical Background

In this section I will gloss over some historical background in order to elucidate why the notion of language is such a central point in Carnap’s philosophy and why LD becomes such an important doctrine among the neo-empiricists of the Vienna Circle.

In the following quotes, Carnap speaks about his general view on the world-language relationship and his view on the specific position of logic with regard to language. He speaks of both in connection with the ideas of two important figures, Wittgenstein and Neurath:³

For me personally, Wittgenstein was perhaps the philosopher who, besides Russell and Frege, had the greatest influence on my thinking. The most important insight I gained from his work was the conception that the truth of logical statements is based only on their logical structure and on the meaning of the terms. (Schilpp, 1963: 24).

We [in Vienna Circle] read in Wittgenstein’s book that certain things show themselves but cannot be said; for example the logical structure of sentences and the relation between the language and the world. In opposition to this view, first tentatively, then more and more clearly, our conception developed that it is possible to talk meaningfully about language and about the relation between a sentence and the fact described. Neurath emphasized these facts in order to reject the view that there is something “higher”, something mysterious, “spiritual”, in language, a view which was prominent in German philosophy. I agreed with him, but pointed out that only the structural pattern,

³It is well-known among Carnap scholars that Carnap’s thoughts, in general, were influenced by many figures such as Frege, Hilbert, Russell, Tarski, Gödel, and others. Yet, the ideas of Wittgenstein and Neurath were more directly concerned with the concept of language than Carnap’s more significant influences.

not the physical properties of the ink marks, were relevant for the function of language. (Schilpp, 1963: 28).

According to Carnap (Schilpp, 1963: 52) it is not possible for Wittgenstein to talk about language in isolation. It is also apparent from the last couple of verses of *Tractatus* that speaking of propositions and rules of language in total separation from where they are being employed is meaningless. Wittgenstein is clear that language appears to be the unique and correlated picture of the world (Wittgenstein, 1958: §95), and that he considers logic as the underlying and hidden "essence of language" (Ibid, §97). For Wittgenstein, in short, language is a tool for revealing some structure of *the world* via representation.

This instrumental role of language, which brings about logic as a representative system, seems to regard language with a different ontological status than that of the rest of the actual world. This seems to be the problem with this view. On this view, language is something by which we, for instance, explain the world. Language is one thing and the world is another. Language is a tool we use to satisfy a purpose. The question, then, is whether or not the two are ontologically distinct. The problem gets worse when we start thinking *about* logic. On the one hand, we start off our search for logic and get to the "essence of language" from accidental linguistic statements. Therefore, we have to acknowledge some sort of dependency between logic and language. On the other hand, we have to say logic or, as Wittgenstein put it, "the rules of possibilities", is totally independent of all language forms. Accordingly, one has to accept a very mysterious status for logic and language with respect to the rest of the world.

Carnap departs from Wittgenstein at exactly this point; unlike Wittgenstein, talking about language in isolation is possible for Carnap because language itself is a worldly object. In agreement with Neurath, along with other members of Vienna Circle, Carnap admits the possibility of speaking *about* language in isolation (Schilpp, 1963: 52). Unlike Wittgenstein, Neurath considers language as something within the world, not something that refers to the world from the outside (Schilpp, 1963: 28). This view of language is one of the most important turns in Carnap's philosophy (Ibid). Language can still preserve its instrumental role, but now it is a tool that works within a system and not outside of it. To give an analogy, although we may deem red blood cells as instruments or tools for transporting oxygen across the body, they are still parts of the human body. The case is different when we consider instruments for constructing buildings, for example. They are tools that are no longer part of the building after its construction. Tools, in this latter sense, have an ontological status over and above the building (just like language and logic in Wittgenstein's view, which have a distinct status over and above the world). In the former case, red blood cells do not bear such a status. Similarly, we may still consider language as an instrument to talk about the world, but, at the same time, language itself is an object of the world that bears a special relationship to other objects.

According to Carnap (Schilpp, 1963: 28), it was this idea that led him to consider what he later called the "logical syntax of language". Centrality of language also helped Carnap take more radical positions against traditional metaphysics, and adopt a more neutral attitude toward "the various philosophical forms of language", e. g., realism, idealism and the like (Schilpp, 1963:17–18, 24). Carnap formulated this neutral attitude in the form of a "principle of tolerance" in his "Logical Syntax of Language" (Carnap, 1937). Now, in settling the mentioned philosophical controversies such as the realist-nominalist debate (which was caused by the diverse use of language), our concerns are to first look at the syntactical properties of the various forms of language, and secondly, the "practical reasons for preferring one or the other form for given purposes" (Schilpp, 1963: 54). Construing philosophical problems as metalinguistic

problems as opposed to linguistic ones is obvious when Carnap explains his major motivation for adopting the syntactic method:

In our discussions in the Vienna Circle it had turned out that any attempt at formulating more precisely the philosophical problems in which we were interested ended up with problems of the logical analysis of language. Since in our view the issue in philosophical problems concerned the language, not the world, these problems should be formulated, not in the object language, but in the meta-language. (Schilpp, 1963: 54)

It might be fair to say that the idea of considering language as an object within the world and, hence, the possibility of talking about language in isolation, were the main motives in formulating LD: logical truths are true by linguistic convention. The adoption of this doctrine was, of course, an established point of consensus among Carnap and other members of Vienna Circle, although Carnap was not completely in agreement with this formulation of the doctrine (Schilpp, 1963: 914). The acceptance of the doctrine immediately implies a linguistic-based and conventional⁴ nature of the logical structure (a LF) that can be revealed via a complete analysis of language. Any theory that provides descriptions of the steps involved in completing such an analysis, as well as explaining all properties, features, and rules involved in taking these steps eventually (and inevitably), proposes or describes the characterizations of a framework according to which one makes assertions. Carnap's attempt to propose such a theory is the subject matter of the following section.

A philosophical linguistic analysis, in general, is concerned with methods of clarifying concepts behind the terms of the ordinary language with respect to the structures in which the terms are being used; one may simply call the methods of this sort an "explication". The notion of a linguistic framework, evidently, is not only of great importance in his linguistic analysis, but is also directly related to the subject matter of Carnap's overall philosophy.

3 Linguistic Framework and its Components

So far, we may summarize the implications of adopting LD as follows:

1. Language has a (logical) structure.
2. In the very *first* attempt of investigating such a structure there has to be a language in place (as an object).
3. Making conventions is part and parcel of such an investigation.

The main question now is how we can investigate the mentioned structure of the language. How does logic (logical structures) emerge? How is it differentiated from the rest of ordinary language? Carnap provides us with a detailed answer (Carnap, 1939), which I will summarize in this section. For Carnap, language is inclusive of a vast array of "communicative signs" (Carnap, 1994: 291–294). The major purpose of Carnap's project, from now on, is to show the ways in which a so-called "scientific language" differs from our ordinary use of language.

⁴Carnap himself would rather not use the term "convention" or "conventional" for fear of giving the impression that there is too much liberty and arbitrariness involved in the process of identifying logical truths. Since this concept becomes clearer in the following section, I use the term as-is and skip the controversy about "convention" or "conventional". In Carnap's own words:

Among the various formulations [...] there are some which today I would no longer regard as psychologically helpful and would therefore avoid. One of them is the characterization of logical truth as based on "linguistic fiat" or "linguistic conventions". [...] The term "linguistic convention" is usually understood in the sense of a more or less arbitrary decision concerning language, such as the choice of either centimeter or inch as a unit of length. (Schilpp, 1963: 914–915)

To put it differently: by what mechanism does a system of scientific statements (in general, science) start to emerge from the context of ordinary statements? It was the work of people like W. C. Morris (e. g., "Foundations of the Theory of Signs") that helped Carnap develop a complete theory of language (Carnap, 1994: 291–294), so that it is inclusive of the entire spectrum of human assertions. The latter ranges from the assertions in ordinary discourses to mathematical and logical assertions. Carnap considers language systems as hierarchical systems consisting of three parts; respectively, from the bottom to the top, these parts are pragmatics, semantics, and syntax⁵. He frequently refers to these three parts in nearly all of his works after 1939 (Carnap, 1939, 1942, 1959, 1994).

Therefore, an analysis of theoretical procedures in science must concern itself with language and its applications. [...] we shall outline an analysis of language and explain the chief factors involved. Three points of view will be distinguished, and accordingly three disciplines applying them, called pragmatics, semantics, and syntax. [...] The complete theory of language has to study all these three components. (Carnap, 1939: 3–4)

These three components have different focuses of attention yet interrelated and, consequently, they lead to different types of research or activity. In pragmatics, the focus is on the world-speaker (world-language) relation. In semantics, what is under investigation is the relation of designation regardless of (or given) the world-language relation (where, for example, we may expand or limit the meaning of a term or phrase in our use of language). Syntax is where we begin to investigate the (logical) structure of language regardless of (or given) the designation relation in semantics. Given that science has its roots in experiencing the actual world, one should keep in mind that the world under investigation in pragmatics is strictly the actual world (see below). Therefore, it consists of a finite amount of objects. One other important point in the subsequent sections, which deals with the methods of constructing a framework for language, is that the language in question is considered to be an instance of actual historical natural languages. Later on, when we talk about the second method of construction, we will consider this topic in light of artificial languages as well.

3.1 Pragmatics

In pragmatics, speakers of the language generate signs for objects, events, relations, properties, etc., in order to communicate inside the language community, understand/explain actual events, construct theories about the world, etc. Carnap considers problems of a factual and empirical nature, which deal with gaining and communicating knowledge, as problems that belong to pragmatics (Carnap, 1942: 250). These problems have to do with the speaker's activities of perception, observation, comparison, registration, confirmation, etc., as far as they lead to (or refer to) knowledge formulated in a language (Carnap, 1942: 245). Pragmatics is where we study methods of testing hypotheses and theories by deriving predictions from them in the form of "observation sentences", and then comparing these predicted results with new

⁵I should note here that the terms "pragmatics", "semantics", and "syntax" have been originally borrowed from the terminology of linguistics, but for Carnap the scope of these terms is broader; they don't have the exact same referent as they do in linguistics (linguistics, as a pragmatic scientific discipline). One should not confuse the scientific, or rather, the more pragmatic uses of the terms, which bear a descriptive nature, with the more theoretical applications of them. The latter is the manner in which Carnap intend to employ them. Linguistics, at the scientific level, is concerned with the study of actualities about an actual language like English. Therefore, semantics and syntax are to be considered as descriptive semantics and descriptive syntax. They eventually yield an English dictionary or an English grammar. At this level of abstraction, we are still at the level of pragmatics (in the Carnapian use of this term). That is why Carnap sometimes has to emphasize the distinction by using expressions such as "logical syntax" or "pure semantics" as opposed to "descriptive syntax" and "descriptive semantics" in order to avoid the confusion. (see Carnap, 1942: 240)

observation sentences: “The outcome of such a procedure of testing a hypothesis is either a confirmation or an infirmation of that hypothesis, or, rather, either an increase or a decrease of its *degree of confirmation*” (Carnap, 1994: 292). Carnap is explicit that “pragmatics is the basis of all linguistics” (Carnap, 1942: 13). According to Carnap, the central subject matter in pragmatics is the speaker who speaks, hears, or writes the expressions of the language, and the method that one may employ in this field is “entirely empirical” (Carnap, 1939: 4–9). The descriptive nature of the pragmatic concepts is what distinguishes them from other concepts, which are of a more theoretical nature.

Naming, for example, at this stage, is primarily of an indexical or ostensive nature (or simply observational), and in consideration of sense data. Thus the truths regarding linguistic phrases of these sorts are to be considered as special kinds of truth called “factual truths” (F-truth). This means it has to be established via observation, empirical factors, and immediate confirmation of the language community. As mentioned by Carnap, pragmatics is where we test our scientific theories about the actual world or where we start to make new ones (Carnap, 1994).

In general, Carnap considers pragmatics as the realm in which we form explicanda. Later on, in pure semantics, we are to provide explicata for them (Carnap, 1955a: 34). Therefore, the construction of the meaning or *intension* of the terms should start at the pragmatic level. The following is an example.

The explicandum “belief” is considered to be the relationship T (not B), between a person and a sentence (not a proposition); because the relationship B , between a person and a proposition is *nonpragmatical* in the sense that “characterizes a state of a person not necessarily involving language” (Carnap, 1955b: 90). That is to say not a relation of the form

$$B(X, t, p)$$

that would say that the person X at the time t believes that p . But, a relation of the form

$$T(X, t, S, L)$$

that would say that the person X at the time t takes the sentence S of the language L to be true (consciously or not). “Now the *pragmatical* concept of *intension* serves as a connecting link between B and T . Let a relation of the form

$$Int(p, S, L, X, t)$$

say that the proposition p is the intension of the sentence S in the language L for X at t ” (Carnap, 1955b: 90–91)

Once a natural language becomes actualized or activated at the pragmatic level, we may disregard the speaker-world relationship, and go up to the semantics where the designation relationship is our central focus. “If we abstract from the user of the language and analyze only the expressions and their designata, we are in the field of semantics” (Carnap, 1942: 9)

3.2 Semantics

In semantics we disregard the speaker of the language and we will only consider the relation of designation that is the relation between a term and its “designatum” (an inside-language relation). Here is where we assign names, properties, relations, etc. to objects, and indirectly determine the truth conditions of the sentences. The more precise the rules we set up for designation, the more accurate the results (or way of speaking). This accuracy, in turn, leads to less controversy in discourses within the language community. Although we ourselves set up the rules for deciding what is right or wrong according to the system (since we are the ones who are making the conventions), the rules are not arbitrary. They are bound to the empirical node mentioned above. This is explicitly clear from the following quotation where Carnap

is talking about an imaginary language "B" which belongs to the world of facts, and our own established semantics for this language, "B-S", and which has all and only the properties that we have constructed by our rules.

Nevertheless, we construct B-S *not arbitrarily* but with regard to the facts about B. Then we may make the empirical statement that the language B is to a certain degree in accordance with the system B-S. The previously mentioned *pragmatical facts are the basis* [...] of some of the rules to be given later. (Carnap, 1939: 7) (Emphasis mine)

Since the main goal of setting semantic rules is to achieve the highest degree of accordance with facts, we are bound to this accordance, and preferring one semantic system over another is not a mere matter of terminological choice but rather a matter of degree of confirmation with respect to the facts. Here is, in semantics, where we define synonymy and where we form our theories of *meaning*.

Semantics would ideally give us an "interpretation" of the language by which we would be able to understand expressions of the language. According to Carnap (Carnap, 1939: 11), understanding a language, a sign, an expression, or a sentence are all due to the semantic rules of the language system.

Let us not forget that we are not entirely unconcerned with empirical observations (at least as far as it concerns descriptive semantics). But at a certain point when setting up semantic rules of designation, we are no longer concerned with non-linguistic objects. Once a natural language becomes actualized or activated at the pragmatic level, we may disregard the world-speaker relationship, and go up to the semantics where the designation relationship is at the center of attention. Here, naming, for example, has a referential characteristic as opposed to an observational or ostensive characteristic it has in pragmatics. That is to say, in semantic, the word "red", for instance, is considered to be a term (an elementary term) and not sense data; whereas in pragmatics the use of the same word is in consideration of the sense data that would allow its attribution be followed by immediate confirmation (or infirmation) of the language community.

Semantics, according to Carnap, is the lowest level of abstraction. Abstraction in semantics may begin by simply switching our observational concern to our concerns about the occurrences of signs. This switch of attention means nothing more than disregarding empirical factors involved in observation and just focusing on the designation relation between the signs and their designata regardless of their actual existence. At this point we are ready to study the inherited language, built up at pragmatics, as an object by itself; we may call it the "object language". So, the mark for entering into the realm of abstraction is just switching our attention from observation to designation by presupposing the existence of the involved objects (events, relations, etc.); this is very similar to the definition of constructivism i. e., the strict interpretation of "there exists" as "we can construct" (Bridges & Palmgren, 2013). Just as we disregarded empirical factors in observation to focus on the designation relation, we may continue disregarding the factual content of the statements even further in order to ascend to higher abstract levels. Now, we are at the level that is called "pure semantics" (L-semantics; L stands for "logical") (Carnap, 1939). In this special semantics, the designata of the signs (sentences, names, connectives and the like) are not outside of the language system, and they are with regard to solely inside-language elements (e. g., L-implication, L-equivalence, L-true, L-false and the like). Thus, in L-semantics, the truth about atomic and molecular sentences

(L-truth) can solely be investigated via the rules of our conventional truth-value assignments regarding the logical connectives.

Investigating the rules that would allow us to make such truth-value assignments in L-semantics (i. e., assigning L-true or L-false) is the goal of the final part of our language analysis, i. e., the syntax. Now we have passed the skin (pragmatics) and the muscles (semantics), and have reached the skeleton of the object-language (syntax).

3.3 Syntax

In syntax, the relation of designation will be completely disregarded. Here, by formalizing, in a meta-language, we determine and set up the rules according to which we may assign semantic terms such as L-true, L-false, and the like, to sentences. Syntactical rules would serve two purposes: constructing proofs and making derivations⁶. Carnap defines C-true sentences (C for calculus) as “the sentences to which the proofs lead” (Carnap, 1939: 17). Logic is a discipline that takes care of this purpose, and Carnap sees it as a system that has been established and developed by thinkers like Aristotle and Euclid, grown up in the hands of philosophers like Leibniz and Boole, and became more comprehensive by mathematicians and philosophers like Schroeder, Frege, Peano, Whitehead, and Russell, and benefitted a good deal from Hilbert’s axiomatic method (Carnap, 1939: 17)⁷.

At the syntactic level our concerns are no longer the objects themselves (i. e., what they do designate, hence their soundness) but the validity of the structure (or sequentiality) of the objects (or signs). “The syntax of a language, or of any other calculus, is concerned, in general, with the structures of possible serial orders (of a definite kind) of any elements whatsoever” (Carnap, 1937: 6). In propositional logic, we call these structures “rules of inference”. With *modus ponens*, for example, successive true appearances of a material conditional and its antecedent guarantee the true appearance of its consequent. For Carnap, semantic, in general, is an interpretation (true or false)⁸ of a calculus (syntax). That is to say the question of C-truth is all about consistency: “A calculus may (but usually does not) also contain rules which determine certain sentences as C-false. If the rules of a calculus determine some sentence as both C-true and C-false, the calculus is called *inconsistent*; otherwise *consistent*” (Carnap, 1939: 17).

None of the rules of calculus (neither rules of formation nor the rules of transformation) in any way refer to designata, according to Carnap (Ibid: 19). Nevertheless, they have been chosen with regard to the semantic so that the extension of the “C-true”, “C-false”, and “C-implicate” in the syntax coincides with that of “L-true”, “L-false”, and “L-implicate”, respectively, semantic (Ibid). Carnap reminds us that, in principle, we are free to choose from infinite possibility of the rules of calculus; whether or not they are practically justified is another issue:

There are an infinite number of other possible choices of primitive sentences and rules of inference which would lead to the same result. This result gives the practical justification for our choice of the rules of B-C [(the calculus of the language B)]. A calculus in itself needs no justification. (Carnap, 1939: 19–20)

⁶“A derivation leads from any not necessarily C-true sentences, called the premises, to a sentence, called the conclusion [(C-implicate)]” (Carnap, 1939: 17). Proofs could be construed as a special sub-class of derivations, namely ones that proceeded from truths, whereas derivations are any move in the proof system, which might proceed from false premises. The conclusion of a proof is a truth. The conclusion of a derivation is indeterminate.

⁷I should notify that I intentionally limited the discussion here to the first order propositional logic to make my point. One of the major objectives of this paper is to give a general schematic view of Carnap’s LF in order to provide a basis for further discussion on the same topic. Consequently, I will avoid getting into more detailed and technical discussions about analyticity or syntactical rules, and leave that for future papers.

⁸see (Carnap 1939: 21) for the conditions of true interpretation.

As in the case of semantics, in the case of syntax, too, Carnap distinguishes descriptive syntax from pure syntax. "Descriptive syntax is related to pure syntax as physical geometry to pure mathematical geometry; it is concerned with the syntactical properties and relations of empirically given expressions (for example, with the sentences of a particular book)" (Carnap, 1937: 7). Therefore, pure syntax inherits at least some of the properties of the descriptive syntax (if we consider a bottom-up move). Or, pure syntax should be respectful (or loyal) to some descriptive properties by making it possible to provide a useful interpretation (if we consider a top-down move). The relation between descriptive and pure syntax can be defined by introducing "correlative definitions" by means of which "the kinds of objects corresponding to the different kinds of syntactical elements are determined (for instance, material bodies consisting of printers' ink of the form ' \vee ' shall serve as disjunction symbols)" (Ibid). For instance, sentences like "the second and fourth sentences of a particular series of sentences (or a passage) contradict one another" or "the third sentence is not syntactically correct (let's say according to English grammar)", are sentences of descriptive syntax. But, sentences like "the sequence $\varphi \supset \psi$ has a general form of $Var(x) Con(x') Var(x'')$ ", where Var stands for variable and Con for constant, belong to pure syntax. At the same time $Var(a) Con(a') Var(a'')$ still have a descriptive nature. "Pure syntax is thus wholly analytic, and is nothing more than *combinatorial analysis*, or, in other words, the geometry of finite, discrete, serial structures of a particular kind" (Ibid).

When we say that pure syntax is concerned with the forms of sentences, this 'concerned with' is intended in the figurative sense. An analytic sentence is not actually 'concerned with' anything, in the way that an empirical sentence is; for the analytic sentence is without content. The figurative 'concerned with' is intended here in the same sense in which arithmetic is said to be concerned with numbers, or pure geometry to be concerned with geometrical constructions. (Carnap, 1937: 7)

As we saw, pure syntax is the level that completely disregards factual content, and so is maximally conventional⁹. According to this schematic, abstraction could be construed as a bottom-up process of simultaneously disregarding factual content and becoming increasingly conventional. From this point of view, one could see, in general, how abstraction could be subjected to degradation and how it could be correlated with some sort of gradual disengagement process at each step. In order to go from a lower level of abstraction to a higher one, we would disregard a relationship, an object or a predicate of some sort, and make some presuppositions at each step. We also saw in this disengagement process that there is a voluntary element of choice or switch of attention involved (that can be justified pragmatically). This choice may be considered either positively, as to which relationship we want to preserve, or, negatively, as to which relationship we no longer want to be engaged with. One noteworthy observation to make in the picture that Carnap draws of abstraction is to note where the major steps of abstraction are taking place, i. e., from pragmatics to semantics and from semantics to syntax. In both cases, there is a single relationship that is being disregarded. Simultaneously, there are presuppositions to be made regarding the relationship on which we want to concentrate. For example, in the case of moving from pragmatics to semantics, the relationship we wanted to concentrate on was the designation relationship between the signs and their designata, and the relationship that we wanted to disregard was the speaker-world relationship or the relationship between the sign and the actual object; therefore, we presupposed the existence of all designata. In the

⁹Strictly speaking, from lacking content to being conventional, is a non sequitur. While becoming conventional via losing the content might not be the case for some Platonic entities, it is clearly the case for non-Platonist logical empiricists.

next major shift in abstraction from semantics to syntax, we wanted to find valid structures regardless of the designation of their elements; therefore, we presupposed the semantical truth of those elements (i. e., we presuppose the designation relationship holds for all the elements).

In the abstraction model just described, we started the construction of our language system from pragmatics all the way to syntax. According to Carnap, as we will see in the next section, this is only one of the two possible ways of constructing a language system, which we may call a bottom-up method (or an abstractive method). The inverse top-down method (or interpretive method) is also possible, which will be explained in the following section.

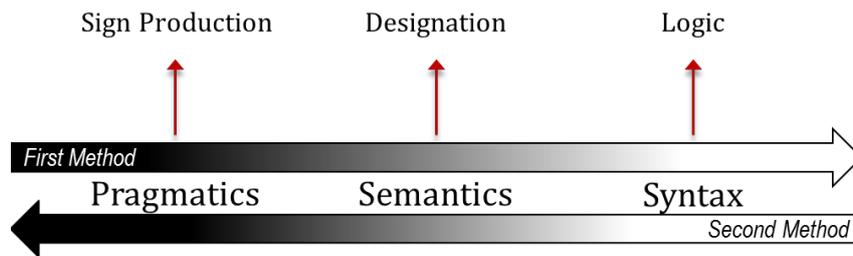


Figure 3.1: Components of a complete language analysis

4 LF and the two methods

Carnap acknowledges that the difference between these three parts is their level of abstraction.

We distinguished three factors in the functioning of language: the activities of the speaking and listening persons, the designata, and the expressions of the language. We abstracted from the first factor and thereby came from pragmatics to semantics. Now we shall abstract from the second factor also and thus proceed from semantics to syntax. (Carnap, 1939: 16)

One may realize that what is interesting here is that Carnap, by establishing the ladder of gradual abstraction (i. e., the gradual loss of factual content), is indirectly suggesting the possibility of a systematic way for dealing with the concept of abstraction. Carnap is clear that if we are to construct a language for science we ought to give up absolute verifiability and consider “gradual confirmation” (Carnap, 1938). He recognizes two methods for constructing a language for science (or basically any sort of language):

Let us suppose we are going to construct an empirical language for the whole of science, [...] At which point in the system of terms shall we begin with the construction? At the one end of the system there are the elementary, concrete terms like ‘blue’ and ‘hard’, which can be applied on the basis of simple observations. On the other end there are the abstract terms as they occur in the most general laws of theoretical physics, e.g. ‘electric field’. There are now two possible ways open to us, each of them having certain advantages. (Carnap, 1938: 33–34)

Before we get into the descriptions of these methods let’s once again consider LF in the following presentation, but this time with respect to the levels of abstraction:

One important point is that, in terms of the factual contents of the sentences, there is some sort of heterogeneity (or factual-conventional duality, if you wish) involved in constructing languages according to this model. That is, the statements in the middle of the factual-conventional spectrum are neither completely factual nor completely conventional. As we have noticed, sentences formed at the lowest level have maximum factual content, and as we go up the abstraction

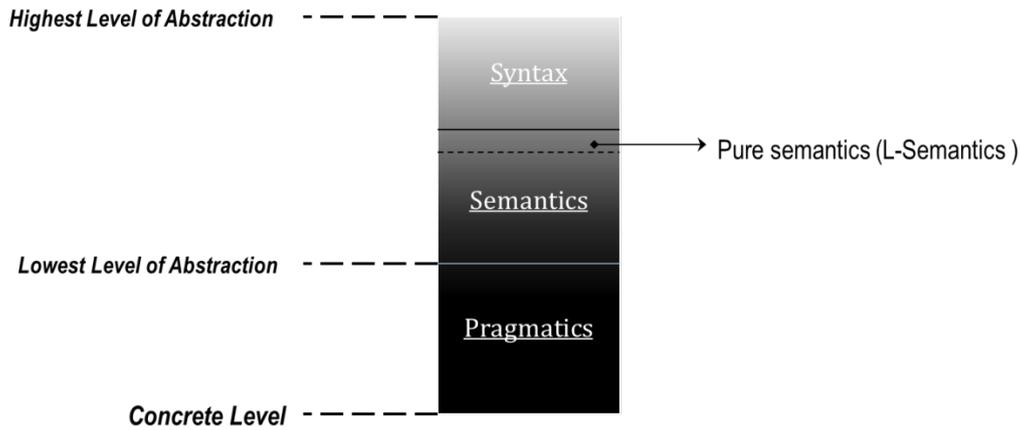


Figure 4.1: Levels of abstraction in a LF

ladder, they lose factual content and become more and more conventional. Consider, for example, how the following set of sentences become more conventional as we go up the abstraction ladder. Looking at the following example gives us a sense of how the statements gradually lose their factual content.

- This is an apple. (Factual)
- The apple is red.
- Red is a color.
- Color is a concept.
- Concept is $F(x)$.
- $F(x)$ is P .
- P is F -determinate.
- P is F -determinate if and only if " $P \wedge \sim P$ " is L -determinate.
- " $P \wedge \sim P$ " is L -determinate if and only if " $P \vee \sim P$ " is C -true. (Conventional)

As we may realize, the construction of a calculus upon which we consider $P \wedge \sim P$ as false (or more specifically, L -false) is purely conventional without any participating factual component. "Now consider the predicator $H \ \& \ \sim H$. No factual knowledge is needed for recognizing that this predicator cannot possibly be exemplified" (Carnap, 1956: 21). In the same way, taking $P \vee \sim P$ as L -determinate (hence analytic) or L -indeterminate (hence synthetic) is entirely based upon the decision of the framework constructor, regardless of any fact. Carnap acknowledges the heterogeneity of LF with respect to the factual content in ESO as well as in other places (e. g., Carnap 1936; 1965). Now we can easily see how we may continue losing factual content up to the syntactical level, where the realm of pure conventions begins.

4.1 The first method

In the first method, we start constructing our language system (LF) by taking elementary terms¹⁰ (such as "blue", "hot", "hard") as primitive terms and then introducing them to higher levels of abstraction. "If a suitable set of elementary terms is chosen as a basis, every other term

¹⁰It is important to notice that regardless of how we arrive at the concepts such as "red", "cold", "hard" and so on (and setting aside the world-language relation), we may still treat them as linguistic entities (belonging to the world of language; where we consider language as an object itself) and call them "elementary terms" (Carnap, 1939: 61). In this way, we pre-assume a certain world-language relation (undetermined and under investigation) about which we are not going to talk, rather we want to talk about language in isolation and as an object in the world. Carnap is clear that "bright", "dark", "red", and other concepts of this sort are "elementary terms" and "meant as properties of

of the language [...] is either definable or at least reducible to them”(Carnap, 1938: 34). The advantage of the first method, according to Carnap, is that “it allows a closer check-up with respect to the empirical character of the language of science. By beginning our construction at the bottom, we see more easily whether and how each term proposed for introduction is connected with possible observations” (Ibid). Thus, the first method is essentially a bottom-up method.

One of the points to which we should pay special attention to, again, is that in the first method of constructing a LF, we are not completely arbitrary precisely because we are empirically constrained. Not paying attention to this point has led to some confusion in the literature. For example, some philosophers, e. g., (Maddy, 2007: 86), hold the idea that making scientific theories is just a mere terminological choice or just a matter of language, for Carnap. As we saw in section 2.2, semantical rules cannot be chosen arbitrarily, and Carnap is clear that they are empirically constrained by factual observations in pragmatics. Since the same relationship that holds between pragmatics and semantics also holds between semantics and syntax (semantics is an abstraction of pragmatics and syntax is an abstraction of semantics), we may say that by the first method of construction, the entire LF is committed to factual observations, and therefore constructing a LF by the first method is not completely arbitrary. Carnap is fairly clear that, in the first method, pragmatic and empirical criteria can be regarded as “practical guides” (or constraints) in setting up rules or making conventions (Carnap, 1939: 6). So in constructing a language system, our choices of rules, for an already-interpreted language (a natural language), are not completely arbitrary. Nevertheless, “nobody doubts that the rules of a pure calculus, *without* regard to any interpretation, can be chosen arbitrarily” (Carnap, 1939: 27) (Emphasis mine).

In sections 11 and 12 of (Carnap, 1939), Carnap is quite clear that in the case of constructing a syntax (or a calculus) for an existing language, which is an instance of employing the first method, we are not completely free and we do bring some commitments to bear. Indeed, we are limited in “some essential respects”, because the syntax must be constructed in such way that it gives us a true interpretation of the existing semantics. The only freedom one may have in this regard would be limited to minor choices in classifying the signs and formulating the rules:¹¹

If a semantical system S is given and a calculus C is to be constructed in accordance with S, we are bound in some respects and free in others. The rules of formation of C are given by S. And in the construction of the rules of transformation we are restricted by the condition that C must be such that S is a true interpretation of C [...]. But this still leaves some range of choice. We may, for instance, decide that the class of C-true sentences is to be only

things, not as sense-data” (Carnap, 1939: 62) thus they already passes a (abstractive) stage that converts sense data into linguistically expressible property-words (i. e., elementary terms); but, while we may consider elementary terms to have independent values, Carnap still consider them as being abstracted from pragmatics. Carnap considers semantic information, in general, to be an approximation to pragmatic information that is achievable by abstraction.

We shall talk about the information carried by a sentence, both by itself and relative to some other sentence or set of sentences, but not about the information which the sender intended to convey by transmitting a certain message nor about the information a receiver obtained from this message. An explication of these usages is of paramount importance, but it is our conviction that the best approach to this explication is through an analysis of the concept of semantic information which, in addition to its being an approximation by abstraction to the full-blooded concept of pragmatic information, may well have its own independent values. (Carnap & Bar-Hillel, 1952: 2-3)

¹¹If we need an example of the choices between different formulations (amongst others), e. g., for propositional logic, we may think of the choices between Łukasiewicz’s system of notations or the notational system of Whitehead and Russell. Both cases, no matter how different they may be, are still committed to satisfying the main condition, which is to provide a true interpretation for the existing semantics.

a proper subclass of the class of L-true sentences, or that it is to coincide with that class or that it is to go beyond that class and comprehend some factual sentences, e. g., some physical laws. [...] This choice, however, is not of essential importance, as it concerns more the form of presentation than the result. If we are concerned with a historically given language, the pragmatical description comes first, and then we may go by abstraction to semantics and to syntax. (Carnap, 1939: 24)

Therefore, in the first method of construction we are not only limited to a true interpretation of the existing semantics, but also committed to the facts of the matter. Carnap also reminds us that the order of the methods is of essential importance because "if we have chosen some rules arbitrarily, we are no longer free in the choice of others" (Carnap, 1939: 25). Then, the first method has an essential priority compared to the second one.

4.2 The second method

Traditionally, being used to the application and rules of one sort of logic might make us prejudiced in favour of that logic; we may even go so far as to construe the system we are familiar with as "obvious". Carnap, on the other hand, sees the possible range of assertions as far more diverse and versatile:

It is important to be aware of the conventional components in the construction of a language system. This view leads to an unprejudiced investigation of the various forms of new logical systems which differ more or less from the customary form (e. g., the intuitionist logic constructed by Brouwer and Heyting, the systems of logic of modalities as constructed by Lewis and others, the systems of plurivalued logic as constructed by Lukasiewicz and Tarski, etc.), and it encourages the construction of further new forms. (Carnap, 1939: 28)

The second method is when we take abstract terms of the highest levels of abstraction or syntax, and introduce them (interpret them) to lower levels all the way to the elementary terms. "If a suitable set is chosen, here again every other term, down to the elementary ones, can be introduced. And here, it seems, explicit definitions will do." (Carnap, 1938: 34). Thus, the second method is a top-down method. The advantage of this method is that "it represents the systematic procedure as it is applied in the most advanced fields of science, especially in physics" (Ibid). If it is to be somewhere, here is precisely where creativity and language planning come to play an essential role.

When using the second method, we are basically free to use whatever calculus (set of syntactical rules) we wish to satisfy our purpose. One of our options is, of course, to stay with the same resulting calculus (let's say classical logic) of the first method and make our changes at lower levels to what Carnap calls "indeterminate statements" (Schilpp, 1963: 920). This might be the most common philosophical/scientific practice, and the result would be LFs sharing the same logic.¹² This fact, of course, does not rule out the other possibility of the adoption of totally different calculi (e. g., intuitionistic logic). If the readjustment¹³ has to be done at highest levels, it will result in a different language. One should keep in mind that

¹²We may think of pure non-Euclidean geometries, which share the same logic as the Euclidean geometry, as an example of this.

¹³In the case of conflict with experience, Carnap distinguishes between two kinds of readjustments (in LF), namely between changing truth-value assignments to the "indeterminate statements" (i. e., statements whose truth value are not fixed by the rules of language, say by the postulates of logic, mathematics, and physics) and changing the language (Schilpp, 1963: 920–921).

even in the case of adopting different calculi, our final interpreted language should ultimately be accountable to the empirical facts of the matter, but the choice of the adoption is only pragmatically, not principally, constrained. There is no logic in choosing logics; one should notice that, in the case of adopting different calculi, we are no longer in the same LF. In the case of changing the language from L_n to L_{n+1} , the concept of “being syntactic”, for example, is totally different in each language. That is, “. . . is syntactic” in L_n is a different concept than “. . . is syntactic” in L_{n+1} ; the same is true for “being analytic” (Schilpp, 1963: 920). Therefore, since the property of “being syntactic” (or “being analytic”) is totally dependent on our choice of syntax (which follows no logic and is only justifiable pragmatically), then, the concept of “. . . is syntactic” is only decidable upon our purely arbitrary chosen calculus. “With respect to a calculus to be constructed there is only a question of expedience or fitness to purposes chosen, but not of correctness” (Carnap, 1939: 25).

The second method of constructing a language system, then, is first to construct a calculus C and then a corresponding semantics S accordingly. And here is how Carnap describes this process:

We begin again with a classification of signs and a system F of syntactical rules of formation, defining ‘sentence in C ’ in a formal way. Then we set up the system C of syntactical rules of transformation, in other words, a formal definition of ‘ C -true’ and ‘ C -implicate’. Since so far nothing has been determined concerning the single signs, we may choose these definitions, i. e., the rules of formation and of transformation, in any way we wish. [. . .] Then we add to the un-interpreted calculus C an interpretation S . Its function is to determine truth conditions for the sentences of C and thereby to change them from formulas to propositions. [. . .] Finally we establish the rules for the descriptive sign (Carnap, 1939: 25–26).

The relevance and effectiveness of our choice of C will finally be determined by the richness of the language it yields. Here is where, once again, empirical data will determine how rich and effective the language is for the purpose of communicating among the targeted community.

Now, the question of the conventionality of logic may become clearer. The question, as Carnap puts it (Carnap, 1939: 27), is as follows: are the rules on which logical deduction is based to be chosen at will, and consequently judged only with respect to convenience but not to correctness? Or, is there a distinction between objectively right and objectively wrong systems, so that in constructing a system of rules we are free only in relatively minor respects (as, e. g., the way of formulation) but bound in all essential respects? One may see, by now, that Carnap’s answers to both questions are affirmative. On one hand, in the unobjectionable possibility of constructing a language system from a calculus C to its corresponding semantics S (the second method), we are free in choosing the rules of C and the choice is simply a matter of convenience. On the other hand, in constructing a language system from the point at which the “meaning” of logical signs are given before the rules of deduction are formulated (the first method), the statements might be considered objectively right or wrong on the basis of the presupposed “meaning” of the signs. Carnap summarizes his response to the question of conventionality of logic in the following passage:

Logic or the rules of deduction (in our terminology, the syntactical rules of transformation) can be chosen arbitrarily and hence are conventional if they are taken as the basis of the construction of the language system and if the interpretation of the system is later superimposed. On the other hand, a system

of logic is not a matter of choice, but either right or wrong, if an interpretation of the logical signs is given in advance. But even here, conventions are of fundamental importance; for the basis on which logic is constructed, namely, the interpretation of the logical signs (e.g., by a determination of truth conditions) can be freely chosen¹⁴. (Carnap, 1939: 28)

It is worth emphasizing again that, up to this point, it is fairly evident that the process of losing factual content is a gradual process that coincides with a corresponding gain in conventionality, and that this eventually leads to the pure conventionality of syntax. This point is of special importance later on where we talk about analytic-synthetic distinctions.

5 Confirmation and changes in LFs

The main question in this section is how do LFs differ from one another? When we are to talk about the difference between LFs, one should pay special attention to the essential differences they may have. According to what has been explained so far, the difference between LFs could be construed at two different levels: the difference could be at the syntactic (or abstractive) level or it could be at the semantic (or interpretive) level. When we are considering a syntactic difference, then we are talking about adopting different logical systems (different syntaxes). Hence, one expects a dramatic change in the framework. In that case, we can no longer talk about the concepts of “right” or “wrong”, since they are internal concepts to each framework. On the other hand, keeping the syntax intact, we may talk about semantic differences between two LFs, and then we may talk about right or wrong *interpretations* (provided our explicandum is unique¹⁵).

If we decide to keep the syntax intact, then what is at stake might be the F-truth of the statements that are to be established by confirmation. We should keep in mind that Carnap does not see any fundamental difference between particular and universal sentences regarding confirmation:

Thus, instead of verification, we may speak here of gradually increasing confirmation of the law. Now a little reflection will lead us to the result that there is no fundamental difference between a universal sentence and a particular sentence with regard to verifiability but only a difference in degree.(Carnap, 1936: 425)

In agreement with Reichenbach, Carnap sees every sentence as a probabilistic sentence subjected to gradual confirmation (Carnap, 1936: 425–427); the higher the level of abstraction, the higher the degree of confirmation. For example, confirming the sentence “the apple in my lunch box is red” requires a lower frequency of supporting instances than “all apples are red”.

The facts do not determine whether the use of a certain expression is right or wrong but only how often it occurs and how often it leads to the effect intended, and the like. A question of right or wrong must always refer to a system of rules. (Carnap, 1939: 6)

I do not intend to talk about Carnap's position on universals and particulars here; what I would like to shed light on is Carnap's avoidance of the terms “right” or “wrong”, generally, in the context of these kinds of changes in LF. Although, using his own vocabulary, one should be allowed to use “F-true” (in the case of confirmation) and “F-false” (in the case of infirmation),

¹⁴Compare a two-valued logic with a many-valued logic, for example.

¹⁵In the case that explicandum is not unique we may have equally right, yet different, interpretations. According to Carnap, this is the case in dealing with the concept of probability: “There are two explicanda, both called ‘probability’: (1) logical or inductive probability (probability1), (2) statistical probability (probability2)”. (Carnap, 1973: 269)

the essential points here are two-fold: one is that in this kind of change, where the syntax is intact, the changes are to be implemented at the lower levels of abstraction, and what is at stake is the subject of confirmation and/or the confirmation method. The second point is the concept of gradual confirmation in accordance with the level of abstraction that may or may not lead to the change of the second kind in the LF.

We have to pay attention to the fact that, considering Carnap's LF, what we refer to as language is slightly different than the ordinary or traditional sense of the word "language". According to what we have seen so far, as long as LFs share the same syntax they are not to be considered as different languages but rather different ways of speaking. In this sense, we no longer refer to English and Persian as different languages, as long as we establish our arguments in both English and Persian according to the same set of rules (e. g., the rules of elementary logic). For Carnap, the same is true for different theories (expressed in the same language) using quantification over two sorts of variables, or only one to cover both ranges, as long as they follow the same logical rules:

Thus our present acceptance of the two more explicit forms of translation is merely an introduction of two ways of speaking; it does by no mean imply the recognition of two separate kinds of entities-properties, on the one hand; classes, on the other.(Carnap, 1956: 17)

What makes a confirmation possible, in a LF, is the part of the LF that makes it possible to drive our predictions (and then test them against the facts). This part, of course, is the syntactical rules of the LF. As long as we keep the logical syntax of a LF intact, we may talk about which theory (or which way of speaking) is F-right/confirmed or F-wrong/infirm. For, the general concept of wrong or right would be decidable only according to the same syntactical rules.

Changing the syntactic rules is, in principle, possible. In this case, what would the resulting LF look like? By changing syntactical rules we are making a radical change in the logical fabric of the LF, and this is the very structure that holds everything together in a LF. The first things to lose as a result of this kind of change would be the concept of "right" or "wrong". "Now, the task is not to decide which of the different systems is "the right logic", but to examine their formal properties and the possibilities for their interpretation and application in science" (Carnap, 1939: 28). The only things left to decide are going to be pragmatic considerations such as simplicity, fruitfulness, and the like, assuming the new syntax could generate a new and fully interpreted language (an artificial language). Again, that it is only in the case of syntactical changes where we refer to different LFs as different languages; as mentioned earlier, in other cases we consider different LFs as different ways of speaking the same language.

To sum up, changing our LF in response to resolving a conflict with experience (or otherwise) can be done in two different ways: one in which the new LF is communicable to the old LF which shares the same logical fabric (and where the statements are sortable according to their degrees of confirmation); and the second in which the new LF is incommunicable to the old one since it does not share the same logical fabric.

6 Analyticity and Quine's objections¹⁶

Before getting into the more detailed discussion, I will present a general picture of how Quine and Carnap construe our belief system, and how they envision the changes in this system.

Quine's proposal: our belief system has a web-like structure that encompasses all our theories, including our theories of logic and mathematics that constitute the core of the web. The periphery of the web is more susceptible to change according to actual facts than the core is. Any changes to this system ought to be initiated from outside of the web even if the readjustments require some changes at the core. Subsequently, any change in our mathematical or logical theories should be essentially in response to some change in our empirical data.

Carnap's proposal: all our beliefs about the world that are expressible in the form of communicable assertions are subjected to a structured system, which provides them meaning. This system (which can be studied in isolation) has a hierarchical structure that is more susceptible to change, according to the facts of the matter at the bottom, and is less susceptible at the top. Since the susceptibility of the structure is inversely proportional to the factual content of the statements, at some point in the structure, the statements have no factual content. The conflict between the system and the facts can be resolved in two ways: (1) implementing changes from the bottom to the top, or (2) making changes in the none-susceptible part of the hierarchy to the desired effect.

So far, we have established the following:

1. The first method of construction is essentially dependent on and is bound to empirical observations (§4.1). Therefore, as far as the first method is concerned, LF is entirely committed to the facts and empirical considerations since it starts from pragmatics (§3.1). (reserving our minor conventional liberties in notations, classifications of the signs, and formulating the rules)
2. The possibility of using the second method with total disregard to the empirical data is an unobjectionable possibility. (§4.2)
3. Carnap admits that resolving a conflict with experience may or may not require syntactical changes. (§4, first quote)
4. Changing the LF is possible in two different ways (§5): by making new ways of speaking (keeping the syntax intact) or making new languages (changing the syntax).
5. The first method is practically prior to the second one.
6. Syntax is purely conventional as it stands at one end of a factual-conventional spectrum or assertion without any reference to the outside objects. (§4)

In his terminology, Carnap makes use of the terms “factual”, “L-indeterminate”, and “synthetic” to refer to the lower levels of abstraction in a LF. “A sentence is called L-determinate if it is either L-true or L-false; otherwise it is called L-indeterminate or *factual*.” (Carnap, 1956: 7). Accordingly, the terms “theoretical”, “L-determinate”, “syntactic”, and “analytic” are being used to refer to the higher levels of abstraction. It is fairly obvious that these terms are intended to use as directional guides. The terms “synthetic” or “analytic” should be considered as indications of a place in a hierarchy, and not a property of an object. To say “all LFs have

¹⁶It may seem that I have not been charitable enough to Quine in this paper as I am citing Quine much less than Carnap. There are two reasons for this: first, since I am defending Carnap's position, it is obvious that I tend to clarify his position by citing his own works. The second reason is that the core of almost all of Quine's arguments against Carnap's points and positions seem to be similar and turn on proving the centrality and fundamentality (absoluteness) of analytic-synthetic distinction. Since I tend to argue against this centrality and fundamentality, citing various versions of the same claim would be redundant.

synthetic statements and analytic ones” is like saying “all geographical regions have an east part and a west part”; no one objects to the east-west distinction, and, for the same reason, the analytic-synthetic distinction is not objectionable, if one considers it this way.

Now, I come to the heart of the matter of the second part of my concerns to briefly show that none of Quine’s major objections address the main points of Carnap’s theory. Quine, according to the evidence given below, clearly does not share the idea that the terms “synthetic”, “factual”, “analytic”, and “theoretical” are supposed to be considered as relative terms pointing to some location rather than absolute ones pointing to some objects. Quine’s confusion is understandable because it is easy to see how a person’s view would have been considered dogmatic and nonsensical if the person thinks of the east-west distinction as an absolute and fundamental one when distinguishing western provinces from eastern ones, for instance.

The ASD is by no means an absolute distinction for Carnap for the following reasons: first, the ASD is a distinction that depends solely upon our decision on where we separate semantics from syntax (simply on our choice of logic). Carnap is fairly clear about this, as I noted earlier. Considering “ $P \vee \sim P$ ” as an L-determinate sentence (or not) is principally based upon our decision, and what to do with the interpretations of P . It is not the case that nature dictates and forces us to consider “ $P \vee \sim P$ ” as an L-determinate sentence, no matter how this principle is inspired by nature. Second, if the ASD was fundamental for Carnap, one could not see any inter-changeability between analytic to synthetic and vice versa. However, in the following letter to Quine, Carnap clearly acknowledges the possibility of such a change, from “being analytic” to “being synthetic” and vice versa:

The difference between analytic and synthetic is a difference **internal** to two kinds of statements **inside** a given language structure; it has nothing to do with the transition from one language to another. “Analytic” means rather much the same as true in virtue of meaning. Since in changing the logical structure of language everything can be changed, even the meaning assigned to the ‘.’ sign, naturally the same sentence (i. e., the same sequence of words or symbols) can be **analytic in one system and synthetic in another**, which replaces the first at some time. (Creath, 1991: 431) (Emphasis mine)

In the previous sections (see §3) you may have noticed that, in introducing and characterizing a LF, we did not make any reference to the ASD, for we did not have to. We saw (see §2 pp. 7) that, by accepting LD, a LF becomes immediate and that there are good reasons for adopting LD. Then, as Carnap mentions in the above quotation, the ASD becomes an internal difference directly decidable upon the set of rules we prefer to take as our set of syntactical rules. Quine, on the other hand, apparently does see this the other way around. Quine holds to the idea that the ASD is a fundamental and absolute distinction for Carnap, and without which neither LF, nor the external-internal distinction, nor other terms such as “artificial language” or “meaning postulates”, and the like, would be possible to use:

Carnap has recognized that he is able to preserve a double standard for ontological questions and scientific hypotheses only by assuming an **absolute** distinction between the analytic and the synthetic; and I need not say again that this is a distinction which I reject. (Quine, 1951: 43) (Emphasis mine)

Modern empiricism has been conditioned in large part by two dogmas. One is a belief in some **fundamental** cleavage between truths which are analytic, or grounded in meanings independently of matters of fact, and truth which are synthetic, or grounded in fact. (Quine, 1951: 20) (Emphasis mine)

In the following quotes, it is even more apparent that Quine takes the ASD as a dogmatic belief that stems from an unnecessary (and perhaps wrong) ontological difference between the two. For him, the ASD refers to a differentiation among objects and entities rather than relative terms in classification:

One conspicuous consequence of Carnap's belief in this dichotomy may be seen in his attitude toward philosophical issues, e. g. as to what there is. It is only by assuming the cleavage between analytic and synthetic truths that he is able e. g. to declare the problem of universals to be a matter not of theory but of linguistic decision. (Quine, 1960)

Now to determine what entities a given theory presupposes is one thing, and to determine what entities a theory should be allowed to presuppose, what entities there really are, is another. It is especially in the latter connection that Carnap urges the dichotomy which I said I would talk about. (Quine, 1951)

Quine also sees Carnap's external-internal distinction regarding existential questions as on par with, or rather, as based upon the ASD. Quine holds that both distinctions would disappear by our trivial choice of the types of variables involved in our scientific theories:

No more than the distinction between analytic and synthetic is needed in support of Carnap's doctrine that the statements commonly thought of as ontological, viz. statements such as 'There are physical objects,' 'There are classes,' 'There are numbers,' are analytic or contradictory given the language. No more than the distinction between analytic and synthetic is needed in support of his doctrine that the statements commonly thought of as ontological are proper matters of contention only in the form of linguistic proposals. (Quine, 1951a: 71)

Quine fails to acknowledge what we explained above concerning the gradual loss of factual content as we move toward more general laws. Because he thinks of the ASD as such a profound and absolute distinction, everything in Carnap's model seems to fall into some sort of black-or-white schema. For Carnap, on Quine's account, statements are either analytic or synthetic, universally (and regardless of our choice of syntax). And, as we saw above, that is not the case for Carnap at all:

Whether the statement that there are physical objects and the statement that there are black swans should be put on the same side of [Carnap's] dichotomy, or on opposite sides, comes to depend on the rather trivial consideration of whether we use one style of variables or two for physical objects and classes. (Quine, 1951a: 69)

In §5 we saw that Carnap (in a way) already admits of the possibility of choosing one or two types of variables (one variable to range over properties/classes and one to range over objects, or just one to range over both), and we saw that Carnap refers to these choices as two different ways of speaking of *the same language*¹⁷. It should be clear that Quine is missing Carnap's main

¹⁷In the §4 of (Carnap, 1956: 17) Carnap speaks about the triviality of referring to the "properties" and "classes". There, he says that the possible translations of "Scot is human" as "Scot has the property of human" or "Scot belongs to (is an element of) the class Human" have the same logical content (as long as the logic stays the same).

[...] the terms 'property' and 'class' seem unnecessary, since there are forms which avoid those terms [(Scot is human)]. Thus the important question may be raised as to whether semantics could not do entirely without those terms. However, we shall first accept them, so to speak, uncritically, endeavoring merely to make their customary use more exact and consistent. [...] Thus our present acceptance of the two more explicit forms of translation is merely an introduc-

point. It is true that we can change our quantification variables, but in both cases we still keep the syntax intact. Still, this is really not the crucial point. Quine goes on to construe Carnap's external-internal questions as category-subclass questions:

The external questions are the category questions conceived as propounded before the adoption of a given language; and they are, Carnap holds, properly to be construed as questions of the desirability of a given language form. The internal questions comprise the subclass questions and, in addition, the category questions when these are construed as treated within an adopted language as questions having trivially analytic or contradictory answers. (Quine, 1951a: 69)

According to our explanations so far, we may agree with Alspector-Kelly (2001) when he says that "Quine's interpretation has Carnap claiming that a sentence turns analytic when the sortal's scope widens far enough for it to count as a universal word. But Quine was wrong" (Ibid: 106). Nevertheless, Quine insists, again, that Carnap's external-internal distinction (as well as his other distinctions, such as ontological-empirical or theoretical-factual) is constructed upon the meaningless ASD. "If there is no proper distinction between analytic and synthetic, then no basis at all remains for the contrast which Carnap urges between ontological statements and empirical statements of existence." (Quine, 1951a: 71). Once again, here we clearly see that Quine base LF on ASD, while, for Carnap, just the inverse is the case. As explained, we begin to construct a LF on the basis of purely empirical statements (in pragmatics); there is no ontological statement to begin with, thus, the validity of our ontological *conclusions* (which we may arrive at them later on, in the process of constructing the LF via abstraction) eventually (and primarily) rest upon our empirical statement's degree of confirmation¹⁸.

We discussed that all these distinctions can be directly predicated upon the conception of a LF (not vice versa), and that a LF is immediate after accepting LD (see §2). That is to say if we agree that logical truths are true by linguistic convention (LD), then we agree that logic is linguistically based, thus we have to look for it in a language system (LF). So, if we want to reject the distinction, all we have to do is to reject LD and LF. One simply cannot accept LD and reject LF. Emptiness of analytic truths from factual content at the syntactic level was very clear to Carnap as well as to other members of Vienna Circle. Carnap is even surprised why Quine finds it necessary to elaborate on this point, given the prior agreements in Vienna:

The main point of his [Quine's] criticism seems rather to be that the doctrine is "empty" and "without experimental meaning". With this remark I would certainly agree, and I am surprised that Quine deems it necessary to support this view by detailed arguments. In line with Wittgenstein's basic conception [LD], we agreed in Vienna that one of the main tasks of philosophy is clarification and explication. (Schilpp, 1963: 216)

tion of two ways of speaking; it does by no mean imply the recognition of two separate kinds of entities-properties, on the one hand; classes, on the other. (Ibid)

¹⁸To put this in another way, on Carnap's account, although in order to understand (finding a meaning for) empirical statements such as "Scot is human", it is quite possible to adopt a method (of analysis) by which we analyse (or translate) this phrase as "there exist something that has the property of being human and the name Scot" (there are, of course, other ways possible). And it is also possible that employing this method makes the customary use of the original phrase more exact and consistent. But, prior to employing this method, one could make no claim with respect to its uniqueness, obviousness, universality, and absoluteness, which precedes its application. Thus all such claims (including ontological ones) become secondary to the method's application and only pragmatically justified.

The centrality and importance of LD, for Carnap, is even more evident where, in a reply to one of Quine's criticisms against his view on logical truth (Quine, 1960), Carnap hopes Quine would not regard LD as a false statement, because it is only then that Carnap is in a difficult situation:

He [Quine] himself says soon afterwards: "I do not suggest that the linguistic doctrine is false". I presume that he wants to say that the doctrine is not false. (If so, I wish he had said so) He nowhere says that the doctrine is meaningless [...].(Schilpp, 1963: 916)

Carnap again returns to LD, where Quine regards elementary logic as "obvious", when he notes that: "Every truth of elementary logic is obvious (whatever this really means), or can be made so by some series of individually obvious steps." (Quine, 1960: 353). First, Carnap is not sure whether Quine is talking about factual obviousness or theoretical obviousness. In fact, we may never know what Quine meant because he does not distinguish the two:

I shall sometimes be compelled to discuss Quine's views hypothetically, that is to say, on the basis of presumptions about the meanings of his formulations, because I have not been able to determine their meanings with sufficient clarity. [...] I presume that he does not understand the word "obvious" here in the sense in which someone might say: "it is obvious that I have five fingers on my right hand", but rather in the sense in which the word is used in: "it is obvious that, if there is no righteous man in Sodom, then all men in Sodom are non-righteous". [...] If Quine has this meaning in mind, we are in agreement. (Schilpp, 1963: 915)

Given that Quine is in agreement with the second sense of the word "obvious", and since Quine adds later on that LD "seems to imply nothing that is not already implied by the fact that elementary logic is obvious or can be resolved into obvious steps."(Quine, 1960: 355) Carnap shows that Quine's argument against his view on logical truth can actually be regarded as a proof of LD (Ibid: 916):

1. Elementary logic is obvious.
2. LD "seems to imply nothing that is not already implied by the fact that elementary logic is obvious".
3. Whatever is implied by LD is implied by (1).

Hence, since LD is implied by LD:

4. LD is implied by (1).

Again, we can clearly see the importance of LD for Carnap. Thus, and in accordance with what I have explained so far, the assumption of LF comes to us naturally, and from there one may impose their theory about the LF's properties, functions, and the like. It seems obvious that we may only talk about all the different distinctions, such as factual-conventional, etc., once we already accept there is such a thing called LF. It might be quite clear by now that none of Quine's presented objections can be construed as objections against Carnap's main points.

In short, I may summarize my points as follows:

1. If the first method of construction (or making changes) is the one and only possible method, then:
 - a. LF, as a whole, is essentially committed to the facts of the matter, and
 - b. There is only one direction (bottom-up) for change. And,
 - c. In that case, the ASD is useless and redundant.

2. If the second method is possible, in addition to the first one, then:
 - a. LF, as a whole, is only committed to the facts essentially in one direction and pragmatically in the other direction. And,
 - b. There are two possible ways for changing LF. And,
 - c. In that case, the ASD is a useful labelling convention.
3. The second method is possible.

Therefore, the ASD is a valid distinction, and it should be regarded as a relative distinction with respect to a LF.

As it may be seen, one may find the Carnapian LF's structure, built by the first method, quite similar to the Quineian "web of belief" (and, in my view, it is). As described, Carnapian LF's structure holds the same commitments to the facts as the Quineian model does. We saw that Carnap acknowledges the possibility of a bottom-up change in syntax, and he refers to such changes as "radical alterations". For Quine, as well, syntactical changes play the same essential and radical role, and that is why he puts them at the center of his web of belief to keep them safe from immediate changes (Quine & Ullian, 1978: 134). Quine takes syntactical rules to be on par with other rules, and, when the time comes, they are not immune to change. The same can be said for Carnap. The only thing that Carnap points out, and that Quine dismisses, is that in the event that such a change has occurred, we are no longer speaking the same language. Consequently, the major difference between the two is that, for Quine, the only legitimate move for readjusting and modifying the structure of our language system is from the boundary to the core of the web (in the Quineian model) or from the bottom of the LF to the top (in the Carnapian model). For Carnap, on the other hand, the move in the other direction is equally legitimate. Quine's justification for taking this position, according to the above discussion, is the obviousness of elementary logic (whatever this might mean). On the other hand, the obviousness of elementary logic, for Carnap, is a theoretical obviousness and belongs to the most conventional part of our language. Therefore, if we admit our principal ability to change whatever we accept conventionally, then change at the syntactical level is both possible in principle and legitimate.

Another interesting conclusion that we may draw from our discussion is that, according to Carnap, coexisting theories in different languages (adopting radically different frameworks) is possible. But, for Quine, there is only one valid theory, i. e. "the theory". It is the theory that encompasses all our explanations about the world. This is the reason that I find Quine's position rather conservative and more akin to traditional ways of thinking.

7 Conclusion

In light of Wittgenstein's and Neurath's views on language, Carnap puts LD at the core of his philosophy. By adopting LD he is allowed to assume a language-based logical structure. The only stipulation that Carnap puts forward at this point is that the process of identifying this structure primarily starts from the bottom of an abstraction hierarchy of a *natural* language. That is, we move from pragmatics to semantics and then to syntax. Our investigation of this structure would come to an end at the highest level of abstraction (syntax) where all the statements' factual contents have been stripped. Once the structure is known, we may refer to the whole construction, inclusive of all the three parts, as a LF. A LF can be construed as a factual-conventional hierarchy for making sense of assertions. Statements at the bottom have factual content, and, as we go upward, they gradually become partly factual and partly conventional/theoretical. Finally, we will arrive at a point in the syntactical level where all

statements are purely conventional and devoid of any factual content. Constructing a LF can be done in two ways: from the bottom to the top (the first method) or vice versa (the second method). There is always a possibility of readjusting or modifying the LF by changing our conventions at different theoretical levels. Introducing modifications into a LF at any level lower than a syntactical level will eventually produce different ways of speaking, while at the syntactical level, they will produce different languages. In principle, we are free to make moderate or radical changes to the LF. We might modify our LF in order to: (1) reach a higher degree of confirmation (according to empirical considerations), or (2) make a simpler and more suitable LF (according to pragmatic considerations). Thus, making a theory, according to this model, is either empirically constrained (when employing the first method, and keeping the same syntax) or pragmatically constrained (when employing the second method, and replacing a different syntax).

According to the given interpretation of LF, we saw that all of Carnap's distinctions, including the ASD, directly hinge upon the conception of LF. We also saw, for Carnap, that the ASD is by no means an absolute distinction. It depends entirely on what arrays of symbols we construe as a constituent part of the syntax (and on where we draw the analytic line). The ASD can only be defined according to a known structure (it is internal to LF). The distinction, regardless of a defined structure, is absolutely meaningless.

Again, according to this interpretation of a LF, one may clearly see that, at the very least, some of Quine's objections cannot be defended and do not affect the main points of Carnap's theory. From this angle, we may be in a better position to understand other important philosophical debates such as the Frege-Hilbert debate¹⁹ on the foundations of mathematics. One may find no fundamental difference between their accounts. The difference, instead, might lie in their corresponding levels of abstraction that they prefer to adopt. Frege might be more committed to a semantical level, whereas Hilbert is posing his ideas at the syntactical level.

Briefly, in this paper, we have established that the conception of LF is a fundamental and unobjectionable concept in Carnap's philosophy; therefore, his external-internal distinction follows almost immediately. What we may refer to as the ASD is mostly concerned with identifying the levels of abstraction in a LF, and not a fundamental distinction. Therefore, it can be seen as a relative or methodological distinction depending on our conventional decision about what is to be included as a synthetic statement (e.g., the law of excluded middle may or may not be considered as a synthetic statement). We also demonstrated that a LF, as a whole, ultimately receives its support from the results of our empirical observations. According to these results, one is quite capable of considering Quine's own established "web of beliefs" system as only one of the many possible examples of Carnap's frameworks. Obviously Carnap would be in a complete agreement with accepting Quine's "web of belief" as a *framework* (as far as it concerns the first method), but he would disagree that this is the one and only possible way of constructing frameworks. Accordingly, one may find Carnap's model for language analysis more fruitful and constructive compared to that of Quine's that, in my view, is more akin to traditional ways of thinking about philosophical problems.

In general, in Carnap's philosophy, one may easily recognise that usually the terms "analytic", "theoretical", and "syntactic" rest on one side of the story (the abstract and purely conventional side), and the terms "synthetic", "factual", and "semantic" rest on the other side (the less-abstract and less-conventional side). Each term in each group is used in order to de-

¹⁹The debate on what would be constituent of a definition for point, line, and surface, for instance. See the correspondence between Frege and Hilbert in (Gabriel, Hermes, Kambartel, Thiel, & Veraart, 1980).

scribe different aspects (or subject matter) in speaking of a LF. And all of them are directly and primarily related to the conception of a LF.

Abbreviations

ASD: Analytic-Synthetic Distinction

ESO: "Empiricism, Semantics and Ontology" (Carnap, 1950)

LF: Linguistic Framework

LD: Linguistic Doctrine of logical truths: logical truths are true by linguistic convention.

References

- Akiba, K. (1995). 'Quine and the Linguistic Doctrine of Logical Truth', *Philosophical Studies* 78(3), 237–256.
- Alspector-Kelly, M. (2001). 'On Quine on Carnap on Ontology', *Philosophical Studies: An International Journal for Philosophy in the Analytic Tradition* 102(1), 93–122.
- Arnold, J., & Shapiro, S. (2007). 'Where in the (World Wide) Web of Belief Is the Law of Non-Contradiction?', *Noûs* 41(2), 276–297.
- Awodey, S. (2007). Carnap's Quest for Analyticity: The 'Studies in Semantics', in: Friedman, M., & Creath, R., eds., 'The Cambridge companion to Carnap', Cambridge University Press, Cambridge, pp. 226–247.
- Berge, W. H. (1995). 'Carnap and Translational Indeterminacy', *Synthese* 105, 115–121.
- Bird, G. (1995). 'Carnap and Quine: Internal And External Questions', *Erkenntnis* 42, 41–64.
- Bridges, D., & Palmgren, E. (2013). 'Constructive Mathematics', in: E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy* (Winter 2013 Edition)
- Burgess, J. P. (2004). 'Quine, Analyticity and Philosophy of Mathematics', *The Philosophical Quarterly* 54(214), 38–55.
- Carnap, R. (1936). 'Testability and Meaning', *Philosophy of Science* 3(4), 419–471.
- Carnap, R. (1937). *The logical syntax of language*, Routledge, London.
- Carnap, R. (1938). 'Empiricism and the Language of Science', *Synthese* 3(12), 33–35.
- Carnap, R. (1939). *Foundations of logic and mathematics*, University of Chicago Press, Chicago.
- Carnap, R. (1942). *Introduction to semantics*, Harvard University Press, Cambridge MA.
- Carnap, R. (1950). 'Empiricism, semantics, and ontology', *Revue Internationale De Philosophie* 4(11), 20–40.
- Carnap, R. (1955a). 'Meaning and Synonymy in Natural Languages', *Philosophical Studies* 6(3), 33–47.
- Carnap, R. (1955b). 'On Some Concepts of Pragmatics', *Philosophical Studies* 6(6), 89–91.
- Carnap, R. (1956). *Meaning and necessity; a study in semantics and modal logic*, University of Chicago Press, Chicago.
- Carnap, R. (1959). *Introduction to Semantics and Formalization of Logic*, Harvard University Press, Cambridge MA.
- Carnap, R. (1967). *The logical structure of the world [and] Pseudoproblems in philosophy* (2 ed.), Routledge, London.
- Carnap, R. (1973). 'Notes on Probability and Induction', *Synthese* 25(3–4), 269–298.
- Carnap, R. (1994). 'Science and Analysis of Language', *Vienna Circle Institute Yearbook* 2, 291–294.

- Carnap, R., & Bar-Hillel, Y. (1952). *An Outline of the Theory of Semantic Information*, MIT Press, Cambridge MA.
- Creath, R. (ed.) (1991). *Dear Carnap, Dear Van: The Quine-Carnap Correspondence and Related Work: Edited and with an Introduction by Richard Creath*. University of California Press, Berkeley.
- Friedman, M. (1999). *Reconsidering Logical Positivism*, Cambridge University Press, Cambridge.
- Friedman, M. (2000). *A Parting of the Ways: Carnap, Cassirer, and Heidegger*, Open Court, La Salle Ill..
- Friedman, M. (2009). *Carnap on Theoretical Terms: Structuralism without Metaphysics*, Paper presented at the Theoretical Frameworks and Empirical Underdetermination Workshop, Düsseldorf.
- Friedman, M., & Creath, R. (eds.) (2007). *The Cambridge companion to Carnap*, Cambridge University Press, Cambridge.
- Gabriel, G., Hermes, H., Kambartel, F., Thiel, C., & Veraart, A. (1980). *Philosophical and Mathematical Correspondance* (Translation: P. Long & R. White), Basil Blackwell, Oxford.
- George, A. (2000). 'On Washing the Fur without Wetting It: Quine, Carnap, and Analyticity', *Mind* 109(433), 1–24.
- Grice, H. (1956). 'In Defense of a Dogma', *The Philosophical Review* 65(2), 141–158.
- Haack, S. (1993). 'The Two Faces of Quine's Naturalism', *Synthese* 94(3), 335–356.
- Hempel, C. G. (1973). 'Rudolf Carnap, Logical Empiricist', *Synthese* 25(3–4), 256–268.
- Hillier, S. (2009). 'Mathematics in Science: Carnap versus Quine', *History of Philosophy Quarterly* 26(4), 409–420.
- Hintikka, J. (1992). 'Carnap's Work in the Foundations of Logic and Mathematics in a Historical Perspective', *Synthese* 93, 167–189.
- Koellner, P. (preprint) Carnap on the Foundations of Logic and Mathematics.
- Lavers, G. (2012). 'On the Quinean-analyticity of mathematical propositions', *Philosophical Studies* 195(2), 299–319.
- Maddy, P. (2007). *Second Philosophy: A naturalistic method*, Oxford University Press, New York.
- McDermott, M. (2001). 'Quine's Holism and Functionalist Holism', *Mind* 110(440), 977–1025.
- OGrady, P. (1999). 'Carnap and Two Dogmas of Empiricism', *Philosophy and Phenomenological Research* 59(4), 1015–1027.
- Oberdan, T. J. (1992). 'The Concept of Truth in Carnap's Logical Syntax of Language', *Synthese* 93(1–2), 239–260.
- Peacock, H. (2011). 'Two Kinds of Ontological Commitment', *Philosophical Quarterly* 61(242), 79–104.
- Price, H. (1997). 'Carnap, Quine and the Fate of Metaphysics', *The Electronic Journal of Analytic Philosophy* 5, Spring 1997, <http://ejap.louisiana.edu/EJAP/1997.spring/price976.html>
- Price, H. (2009). Metaphysics after Carnap : the ghost who walks?, in: Chalmers, D., Manley, D. & Wasserman, R. (eds.), 'Metametaphysics: New Essays on the Foundations of Ontology', Oxford University Press, Oxford, 320-346.
- Psillos, S. (2000). 'Carnap, the Ramsey-Sentence and Realistic Empiricism', *Erkenntnis* 52(2), 253–279.

- Psillos, S. (2000). 'Rudolf Carnap's 'Theoretical Concepts in Science'', *Studies in History and Philosophy of Science* 31(1), 151–172.
- Quine, W. V. O. (1951). 'On Carnap's views on ontology', *Philosophical Studies* 2, 65–72.
- Quine, W. V. O. (1960). 'Carnap and logical truth', *Synthese* 12, 350–374.
- Quine, W. V. O., & Ullian, J. S. (1978). *The web of belief* (2 ed.), Random House, New York.
- Quine, W. V. O. (1951). 'Two Dogmas of Empiricism', *The Philosophical Review* 60(1), 20–43.
- Quine, W. V. O. (1951a). 'On Carnap's Views on Ontology', *Philosophical Studies* 2(5), 65–72.
- Quine, W. V. O. (1960). 'Carnap and Logical Truth', *Synthese* 12(4), 350–374.
- Richardson, A. (2007). Carnapian Pragmatism, in: Friedman, M., & Creath, R. (eds.) 'The Cambridge companion to Carnap', Cambridge University Press, Cambridge, pp. 295–315.
- Richardson, A. W. (2003). Rudolf Carnap in: M. J. Brucoli & R. Layman (eds.), 'Dictionary of Literary Biography: American Philosophers before 1950' (Vol. 270), Cengage Gale, pp. 27–42.
- Runggaldier, E. (1984). *Carnap's Early Conventionalism: An Inquiry into the Historical Background of the Vienna Circle*, Editions Rodopi, Amsterdam.
- Schilpp, P. A. (1963). *The philosophy of Rudolf Carnap* (The Library of Living Philosophers, Vol. 11). Open Court, La Salle, Ill.
- Soames, S. (2009). Ontology, analyticity, and meaning: the Quine-Carnap dispute, in: David John Chalmers, David Manley & Ryan Wasserman (eds.), 'Metametaphysics: New Essays on the Foundations of Ontology', Oxford University Press, Oxford, pp. 424–443.
- Sober, E., & Hylton, P. (2000). 'Quine', *Proceedings of the Aristotelian Society, Supplementary Volume* 74, 237–299.
- Stein, H. (1989). 'Yes, but... Some Skeptical Remarks on Realism and Anti-Realism', *Dialectica* 43(1–2), 47–65.
- Tsou, J. Y. (2003). 'The Justification of Concepts in Carnap's Aufbau', *Philosophy of Science* 70(4), 671–689.
- Wittgenstein, L. (1958). *Philosophical investigations*, Basil Blackwell, Oxford.
- Yablo, S. (1998). 'Does Ontology Rest on a Mistake?', *Aristotelian Society: Supplementary Volume* 72, 229–261.