On the Significance of Analyticity:

A Study on the Controversy between Carnap and Quine

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ABSTRACT

On the Significance of Analyticity:

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This thesis is a study on the significance of analyticity, in particular, on the controversy between Carnap and Quine regarding analyticity. The analysis follows an historical order of Carnap's two periods: syntax and semantics. I argue that Carnap's conception of analyticity is different between these two periods. In the period of syntax, Carnap attempts to give a method for the specification of analytic sentences that will capture all and only truths of logic and mathematics. I argue that he does not aim to demonstrate how these truths are justified, and hence his conception of analyticity is *methodological* rather than *epistemological*. I then discuss Quine's objections in "Truth by Convention" and show that they are against the epistemic significance of analyticity and hence cannot be directed to Carnap. Yet there is a problem; Carnap formulates the analytic/synthetic distinction supposing that the logical/descriptive distinction is at hand. Despite this problem, my analysis will support the conclusion that Carnap's investigations illuminate the structure of scientific theories.

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In the period of semantics, Carnap's conception of analyticity gains an epistemic significance: analytic truths are true by virtue of linguistic convention. Quine argues against this conception in two aspects: the specification of analytic truths needs an account of synonymy and the epistemic corollary of this conception is mistaken. The emphasis in philosophical discussions is given to the problem of synonymy. However, I will conclude that the historical analysis made in this thesis shows that the basis of the problem is the latter, which is epistemological.

KISA ÖZET

Analitik Kavramının Anlam ve Önemi:

Carnap ve Quine Arasındaki Uzlaşmazlık Üzerine Bir İnceleme

Buket Korkut

Bu tez Carnap ve Quine arasındaki analitik kavramının anlamı ve önemi hakkındaki uzlaşmazlık üzerine bir çalışmadır. İnceleme Carnap'ın sentaktik ve semantik adlı iki dönemiyle aynı sırayı takip etmektedir. Bu iki dönem arasında Carnap'ın analitik kavramının içeriğinin farklı olduğunu savunuyorum. Sentaktik döneminde Carnap sadece ve bütün mantıksal ve matematiksel doğruları kapsayacak sekilde analitik cümleleri belirlemeye yarayacak bir yöntem geliştirmeye çalışmıştır. Bu doğruların nasıl ispatlandığını göstermeyi amaçlamadıgı için Carnap'ın analitik kavramının epistemik değil, metodolojik bir kavram oldugunu savunuyorum. Bu bağlamda Quine'ın "Uzlasım Olarak Doğruluk" adlı makalesindeki itirazlarını inceleyip, karşı cıktığı analitik kavramının epistemik olduğundan haraketle bu itirazlarının Carnap'a yöneltilemeyeceğini savunuyorum. Halihazırda varolan problem ise Carnap'ın analitik/sentetik farkını belirleyebilmek icin mantıksal/betimsel ayrımını varsaymasıdır. Bu probleme rağmen bu tezdeki analizler Carnap'ın incelemelerinin bilimsel teorilerin yapısını aydınlattığı görüşünü desteklemektedir.

Semantik döneminde ise Carnap analitik kavramınına epistemik bir önem yüklemektedir: analitik doğrular dildeki uzlaşımlar üzerinden doğrulanmaktadır. Quine bu kavrayışa iki yönden karşı çıkmaktadır: analitik doğruların belirlenebilmesi için eşanlam kavramının açıklanmasına ihtiyaç vardır ve bu kavrayışın epistemik sonuçları yanlıştır. Felsefe tartışmalarında ağırlık verilen konu eşanlam kavramının tanımlanması problemi olmuştur. Buna karşılık, bu tezdeki analizler sonucunda ikinci problemin daha önemli oldugu sonucuna varıyorum.

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1. Introduction

The controversy on analyticity between Rudolf Carnap and Willard van Orman Quine emerges with Quine's publication of the "Two Dogmas of Empiricism". In this paper Quine basically argues that the attempts to define analyticity with semantic notions fail. Originally the roots of Quine's doubt about the significance of analyticity go back to his earlier paper, "Truth by Convention". More accurately, his doubts first arise in "Truth by Convention", reach their peak in "Two Dogmas of Empiricism" and take their final shape in "Carnap and Logical Truth". Accordingly I will mainly focus on these three papers for the analysis of Quine's objections. As opposed to Quine, Carnap believes that the explication of analyticity is important for the philosophical and methodological discussions of science. Therefore he gave a remarkable place to the notion of analyticity in each period of his philosophical career. In this thesis, I will restrict my analysis to his works after *Aufbau*.

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In the philosophical literature, the discussions about this issue are mostly focused on Quine's first argument in "Two Dogmas". The argument claims that analyticity cannot be explicated semantically without falling into circularity. To this end, Quine examines the notions of synonymy, state-descriptions, definition, interchangeability, semantical rules and shows that one way or another all these notions already presuppose analyticity. The initial reactions to the controversy were focused on the adequacy of Quine's requirement for further explanations of the semantic notions that underlie analyticity. ¹ Some took Quine's demand for a definition of "analytic in

¹ Benson Mates (1951) argues that the difficulty in defining analyticity does not necessarily mean that it is impossible to find a way to define it properly. H. P. Grice and P. F. Strawson (1956) also focus on the first argument and analyse whether Quine can, in principle, abandon the analytic/synthetic

L" for L ranging over the natural languages *exorbitant*. Others, with the high battery of Quine's argument, agreed on abandoning the previous definitions but not the distinction itself.

As opposed to these interpretations, I believe that the basis of the disagreement between Carnap and Quine is not about what the definition of analyticity should be or what it means for a sentence to be analytic but instead on the significance of the notion of analyticity within philosophical investigations. For this reason, it is important not to restrict the discussion with the first argument of "Two Dogmas". Quine's second argument against the verification theory of meaning (in "Two Dogmas of Empiricism"), his antecedent doubts (in "Truth by Convention") and his particular analysis of Carnap's conception (in "Carnap and Logical Truth") constitute the crucial discussion.

In my analysis of Carnap's view, I will follow the customary division made for his post-*Aufbau* period: the period of logical analysis based on *syntax* and the period after his *semantical* turn. Some commentators rightly argue that such a division disregards the continuity of Carnap's linguistic analysis.² I also think that the step from syntax to semantics was not actually a big one since Carnap had already made

distinction. R. M. Martin (1952) criticises Quine's requirement for a definition of 'analytic in' L,where L ranges over natural languages.

 $^{^2}$ Creath (1990), Coffa (1991), and Ricketts (1996) for different reasons, say in common that the movement from syntax to semantics does not reflect a "dramatic change" in Carnap's view as it is usually thought. My interpretation is in parallel mostly with Rickett's reasoning and partly with Coffa's. Both maintain that Carnap's syntactic conception of analyticity was in the same line with Tarski's semantic conception of truth. With this I also agree. Beyond that I argue that it is after his semantical turn that Carnap's conception of analyticity diverged from Tarski's semantic conception of truth. More explicitly, after semantical turn Carnap's conception of analyticity gained an epistemic import.

use of semantic concepts (i.e. valuation etc.) within his syntactic analysis. Still I believe that there is a difference between the two periods with respect to the notion of analyticity. Carnap's conception of analyticity changes soon after his semantical turn. For this reason, I will discuss the significance of analyticity for each period separately. Accordingly, the distinction between Carnap's two stages, namely syntax and semantics, will help me to distinguish between these two notions of analyticity.

The period beginning from early 30's up to the publication of "Testability and Meaning" in 1936 is what I consider to be Carnap's *period of syntax*, and the period from 1936 up to the publication of *Meaning and Necessity* in 1947 I consider to be his *semantic period*. I conceive "Testability and Meaning" as a turning point for Carnap in terms of his conception of analyticity. This article yields the first sign of the revision in Carnap's conception of analyticity. The revision is due to Carnap's view that there is a close connection between semantics and verification (and hence epistemology) from the perspective of empiricism. I will argue that with his semantical turn analyticity gained an epistemological significance while in his period of syntax Carnap's notion of analyticity was neutral towards epistemic concerns.

Accordingly, in this thesis I will focus on the significance of analyticity that underlies Carnap's conception for these two periods and Quine's respective objections. I will start my analysis with the notion of analyticity in Carnap's period of syntax. Then I will turn to Quine's paper, "Truth by Convention" and discuss whether it is an objection to Carnap's conception of analyticity. I will argue that Quine's objections do not actually target Carnap in this particular paper and their views are compatible in this period. I will then analyse the notion of analyticity gains

an epistemic import in this period. I will finally show that Quine's criticism in his two later papers, "Two Dogmas of Empiricism" and "Carnap and Logical Truth", are against this semantic notion of analyticity which starts to carry epistemic significance.

I believe that there is some truth in what each philosopher says. For this reason, I find it important to clarify the difference in Carnap's conception of analyticity between the two periods and accordingly to specify the target of Quine's objections. The basic motivation of this thesis is to illuminate what insights they offer rather than to defend one against the other.

2. Carnap's Period of Syntax

2.a The Philosophy behind Logical Syntax

In *Logical Syntax of Language (LSL)*, Carnap invites us to replace "philosophy by the *logic of science* - that is to say, by the logical analysis of the concepts and sentences of the sciences". This is understandable since for Carnap "the logic of science is nothing other than the logical syntax of the language of science". According to Carnap, "the aim of logical syntax is to provide a system of concepts, a language, by the help of which the results of logical analysis will be exactly formulable". For Carnap syntax is concerned with that part of language which has the attributes of a calculus; that is, syntax is limited to the formal aspects of language. He leaves semantical, psychological and sociological study of language aside and restricts syntax to the formal properties of expressions (All quotations in the paragraph are from Carnap (1934) xiii).

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Carnap considers logic to have a different significance from that of its traditional usage. He informs us that the chief task of logic was supposed to be that of formulating rules according to which judgements may be inferred from other judgements. In opposition to this standpoint Carnap considers "logical syntax" as a system which consists of the rules of *formation* that are "the syntactical rules in the narrow sense" and the *transformation* rules that are "the logical rules of deduction" (Carnap (1934) 2). Both formation and transformation rules, according to Carnap, can be formulated in syntactical terms once logic is considered as part of syntax. For the construction of a logical syntax Carnap thinks that it is also important to distinguish two modes of speech: *material* and *formal* mode. Material mode of speech does not distinguish objects of investigation from linguistic expressions.

Carnap believes that formulating in the material mode may easily lead to pseudoobject-sentences, which mislead us into thinking that we are dealing with extralinguistic objects. Carnap thinks that this can be avoided by switching into the formal mode; into the syntactical sentences about linguistic expressions. Accordingly, logical syntax of a language is "the *formal theory* of the linguistic forms of that language – the systematic statement of the formal rules which govern it together with the development of the consequences which follow from these rules" (Carnap (1934) 1).

Correspondingly, Carnap distinguishes between two languages: first, the language which is the object of investigation, *object language*, and second, *syntax language* (meta-language) in which one speaks about the object language of in terms of syntactical forms.

Carnap also classifies object languages into two according to the nature of the expressions occurring in them: *logical* languages and *descriptive* languages. A language is called logical if it contains only logical expressions; otherwise, if it also includes descriptive terms then it is called a descriptive language. Depending on the kind of transformation rules used there is another distinction between languages: *L-language* and *P-language*. The former has only L-rules (logical rules) as transformation rules while the latter also includes P-rules (physical rules) as part of transformation rules. Carnap warns us that the distinction between L-language and P-language does not necessarily coincide with the distinction between logical and descriptive languages. Hence a language may be L-language while being descriptive, which is the case for both of the languages, I and II, that he investigates in LSL (see Carnap (1934) 178-182).

Carnap introduces an extended concept for inference; that is *consequence*, which is based on both P-rules and L-rules. A narrower concept of consequence, *L*-*consequence*, is an inference based on only L-rules. He defines that a sentence is *valid* if it is a consequence of the null class of premises. By contrast, a sentence of a language system is called *contravalid* if every sentence of this system is a consequence of that sentence. A sentence is called *determinate* if it is either valid or contravalid. If it is neither valid nor contravalid then it is called *indeterminate*.

For P-languages the classification of sentences is as follows:



A sentence is called *analytic (L-valid)* if it is an L-consequence of the null class of premises. If a sentence is valid but not analytic then it is P-valid. A sentence is called *contradictory* if every sentence of the language is an L-consequence of the same. A sentence is called *L-determinate* if it is either analytic or contradictory; otherwise it is called *L-indeterminate or synthetic*. If a sentence is valid, but not analytic, then it is called *P-valid*. If a sentence is contravalid, but not contradictory, then it is called *P-valid*. If a sentence is contravalid, but not contradictory, then it is called *P-valid*. (See Carnap (1935) 48-55).

For L-languages every consequence relation in them is an L-consequence; hence only analytic sentences are valid in them. The grouping among the sentences of an Llanguage is as follows: analytic (L-valid), contradictory (L-contravalid) and synthetic (L-indeterminate) sentences. The classification is then as follows:

analytic	synthetic	contradictory
valid	indeterminate	contravalid

Carnap's specific project in LSL is to search and establish the means for the logic of science, in other words for the methodology of science. Carnap believes that the methodology of science can be analysed through the syntactic analysis of language of science. Accordingly, Carnap tries to present and develop the logical syntax of two different language systems (I and II) and makes a further attempt to develop a general syntax. He works on two languages: Language I, a simple language which includes elementary arithmetic of natural numbers and Language II, a richer language which includes classical mathematics. Both of these languages (I and II) are descriptive (i.e. they contain descriptive expressions and synthetic indeterminate sentences). However they are L-languages since every consequence-relation in them is an L-consequence; hence all and only analytic sentences are valid in them. Finally in LSL Carnap attempts to formulate a general syntax which "relates not to any particular individual language but either to all languages in general or to all languages of a certain kind" (Carnap (1934) 153).

2.b Epistemology Reconsidered as Logic of Science

A few years before the publication of *The Logical Syntax of Language*, Carnap summarised his epistemological perspective in *Unity of Science* as follows:

Epistemology claims to be a *Theory of Knowledge*, to answer questions as to the validity of knowledge, the basis on which knowledge rests. Here again are to be found many answers from various '-isms'; naïve and critical Realism, subjective and objective and transcendental Idealism, Solipsism, Positivism, etc., have many different answers. We supply no new answer but reject the questions themselves since they seem to have the same character as those of Metaphysics. (The case is altered if the questions are formulated not as philosophical enquiries but as psychological enquiry concerning the origin of knowledge; in the latter form the question is proper to Science and can be investigated by the empirical methods of Psychology; but such an answer has nothing to do with the philosophical theses of the –isms mentioned.) If 'Epistemology' is understood to denote unmetaphysical, purely logical analysis of knowledge, our work certainly falls under that classification (Carnap (1932) 23).

Here Carnap tries to re-formulate the subject matter of epistemology. If epistemology is concerned with the foundations of knowledge with respect to the question of justification, Carnap rejects the question itself since, for him, all the answers from various schools have the same character as those of metaphysics.

According to Carnap, epistemology in its ordinary form consists of both psychological and logical questions:

Epistemology or theory of knowledge in its usual form contains both psychological and logical questions. The psychological questions here concern the

procedure of knowledge; that is, the mental events by which we come to know something (Carnap (1935) 83).

The questions, which concern all kinds of sensations, feelings, thoughts, images, etc., are what Carnap means by "questions of psychology". These psychological questions, says Carnap, are proper to science itself rather than philosophy and should be investigated by the empirical methods of psychology. In other words, he tries to eliminate the psychological questions not from the region of *knowledge* but from the region of *theory of knowledge*. On empirical grounds, the question of how one is justified to assent a sentence to be true, is a question of empirical sciences, mostly that of psychology. The only area left for philosophical enterprise is the *logic of science* that is the syntactical analysis of scientific language.

Psychological questions concern all kinds of psychic or mental events, all kinds of sensations, feelings, thoughts, images, etc., whether they are conscious or unconscious. These questions of psychology can be answered only by experience, not by philosophising (Carnap (1935) 34).

With this background, in LSL, Carnap invites us to replace "philosophy by the *logic* of science - that is to say, by the logical analysis of the concepts and sentences of the sciences, for the logic of science is nothing other than the logical syntax of the language of science" (Carnap (1934) xiii). By *logic of science* Carnap means the theoretical procedures in science, in other words the *methodology* of science. Here methodology is used in theoretical sense referring to the reasoning in scientific activity, more explicitly, referring to the particular question: How does scientific analysis proceed in order to achieve certain conclusions? According to Carnap an

analysis of the methodology of science must concern itself with *language* since for theoretical activities scientists work on the formulations *in language*:

The material on which the scientist works in his theoretical activities consists of reports of observations, scientific laws and theories, and predictions; that is, formulations in language which describe certain features of facts. Therefore, an analysis of theoretical procedures in science must concern itself with language and its applications (Carnap (1935) 2-3).

This new understanding of epistemology as the *logical analysis of language of science*, for Carnap, is concerned with that part of language which has the attributes of a calculus – that is limited to the formal aspects of language. Correspondingly, the aim of logical syntax is to provide a system of concepts, a language, by the help of which the results of logical analysis will be exactly formulable. Through this syntactical analysis Carnap aims to reach a methodological clarification. "The purpose of the present work is to give a systematic exposition of such a method, namely of the method of 'logical syntax' " (Carnap (1934) xiii).

Carnap gives liberty to everyone for the construction of a logical syntax since he says that we need not provide any substantiation for the establishment of the *syntactical rules*, i.e. how they are foundationally justified. The foundational notions of epistemology such as justification and meaning are meant to fall away; that is what Carnap explicitly informs us from the very beginning in LSL:

Up to now, in constructing a language, the procedure has usually been, first to assign a meaning to the fundamental mathematico-logical symbols, and then consider what sentences and inferences are seen to be correct in accordance with this meaning. Since the assignment of the meaning is expressed in words, and is,

in consequence, inexact, no conclusion arrived at in this way can very well be otherwise than inexact and ambiguous. The connection will only become clear when approached from the opposite direction: let any postulate and any rules of inference be chosen arbitrarily; then this choice, whatever it may be will determine what meaning is to be assigned to the fundamental logical symbols. By this method, also, the conflict between the divergent points of view also disappears. For language, in its mathematical form, can be constructed according to the preferences of any one of the points of view represented; so that no question of justification arises at all, but only the question of the syntactical consequences to which one or other of the choices leads, including the question of noncontradiction. The standpoint, which we have suggested – we will call it the **Principle of Tolerance** – relates not only to mathematics but to all questions of logic in general (Carnap (1934) xv).

Carnap proposes a change in method for the analysis of scientific knowledge. Principle of Tolerance tells us to choose any postulate and rules of inference conventionally (arbitrarily) without any foundational analysis in terms of justification and meaning. By this method, which is the converse of the previous investigations, no question of justification arises at all, but only the question of the syntactical consequences to which one or other of the choices leads. Carnap thinks that in this way the conflict between the divergent points of view also disappears. In adopting the Principle of Tolerance Carnap does not aim to provide a solution to the foundational problems of logico-mathematical rules that underlie the logical syntax of language. Carnap tries to recast the problem of justification with his Principle of Tolerance rather than solving it via enduring a foundational project. The foundational question of justification for syntactical rules should be replaced with a pragmatical one; the question of the syntactical consequences to which one or the other of the choices leads, as Carnap himself puts it:

The task is not to decide which of different systems is "the right logic" but to examine their formal properties and the possibilities for their interpretation and application in science. It might be that a system deviating from the ordinary form will turn out to be useful as the basis for language of science (Carnap (1939) 28-29).

Some commentators seem to argue that in LSL Carnap places the foundations of logic and mathematics at the centre of his inquiries and is concerned, just as Kant was, with the question: "How is mathematics possible?"³ Accordingly, they say that Carnap aimed to show how mathematics is indeed analytic while being a priori. In other words, he is said to be concerned with demonstrating that statements of mathematics are analytically true.

This interpretation is actually a projection of a casual understanding of logical positivists' views on Carnap's. Logical positivists are usually interpreted as claiming: "There is no synthetic a priori knowledge. All a priori knowledge is analytic and all a posteriori knowledge is synthetic. Accordingly the statements of mathematics are analytic a priori and the statements of empirical sciences are synthetic a posteriori". I will not discuss whether this is the right presentation of logical positivists' program in general. However, it is not adequate to interpret Carnap as following such a

³ See Evert Beth (1963), and Michael Friedman(1999). In general, their interpretation of Carnap's views in his period of syntax is in the same line with this thesis. Yet they argue that Carnap's explication of the concept of analyticity in LSL is incompatible with Gödel's incompleteness result, and also it is viciously circular. This is where I diverge from them. I think they would have been right if Carnap had aimed a foundational project, which I argue that it is not the case.

project in LSL. This causal interpretation actually distorts the whole philosophical aspect of LSL, and derivatively its success.

Gödel, in his paper, "On Formally Undecidable Propositions of Principia Mathematica and Related Systems" (1931), showed that not all of the mathematical truths can be proved within mathematics itself. Hence if Carnap aimed to explicate a notion of analyticity in terms of provability to demonstrate how mathematical truths are analytic, then he would have attempted an entirely foundational but technically hopeless project. However from many passages of LSL, it is clear that Carnap knew the results of Gödel's theorem and I assume that his intention was not to overcome it but at most to find a way for avoiding it.

The technical success of LSL can only be judged once the aim of Carnap's project is understood properly. At the beginning of this section it is explained that in LSL Carnap does not intend a foundational investigation for the justification of the logicomathematical rules, which form the syntactical part of the language. In other words, Carnap does not propose to demonstrate how mathematical statements are warranted. With his principle of tolerance Carnap replaces the question of justification with a pragmatic question of technical expedience. Indeed in LSL Carnap is quite aware of the technical handicaps due to the results of Gödel's theorem. He aims to dissolve the foundational disputes concerning logico-mathematical systems by recasting the enigma with his Principle of Tolerance rather than solving it via following a foundational project. There is a change in method that Carnap presents here. In adopting the Principle of Tolerance Carnap does not assume to provide an answer to the foundational questions of justification. He simply puts them away.

Carnap recommends banishing the foundational questions of justification for the logical systems. He believes that the range of possible language-forms is incomparably greater than the narrow circle to which earlier investigations in modern logic have been limited. He says that the reason of this limitation is the requirement of justification understood in the traditional way. Carnap explains the problem of justification as follows: "The fact that no attempts have been made to venture still further from the classical forms is perhaps due to the widely held opinion that any such deviations must be justified - that is, that the new language-form must be proved to be 'correct' and to constitute a faithful rendering of 'the true logic' " (Carnap (1934) xiv). As opposed to this requirement, Carnap suggests a tolerance: "we have in every respect complete liberty with regard to the forms of language; that both the forms of construction of sentences and the rules of transformation (the latter are usually designated as "postulates" and "rules of inference") may be chosen quite arbitrarily" (Carnap (1934) xv). The only requirement for these systems, according to Carnap, is technical expedience, which is a pragmatic concern. In short Carnap argues that the right question for these systems is not the question of justification of their rules individually but the question of technical expedience of the system as a whole. Accordingly in LSL Carnap does not aim to explicate a notion of analyticity in terms of provability to demonstrate how mathematical truths are justified.

2.c The Significance of Analyticity in Logical Syntax

But there is still a notion of analyticity that Carnap works on in LSL that needs to be explained here. What is the significance of analyticity if Carnap does not provide an epistemological explanation of truth as warranted belief? I will first examine the sense of analyticity inherent in Carnap's period of syntax which will also provide us his strategy to avoid damaging consequences of Gödel's results.

In Carnap's syntactic investigation of language, the significance of analyticity hinges on the role of logico-mathematical part of the language, more explicitly on the role of mathematics within science, i.e. empirical knowledge. Let us first pay attention to Carnap's conception of logic and mathematics as applied in empirical sciences. In *Foundations of Logic and Mathematics*, Carnap aims to clarify this particular role of logic and mathematics:

Concerning mathematics as pure calculus there are no sharp controversies. These arise as soon as mathematics is dealt with as a system of "knowledge"; in our terminology, as an interpreted system. Now, if we regard interpreted mathematics as an instrument of deduction within the field of empirical knowledge rather than as a system of information, then many of the controversial problems are recognised as being questions not of truth but of technical expedience. The question is: Which form of the mathematical system is technically most suitable for the purpose mentioned? Which one provides the greatest safety? (Carnap (1939) 50).

Carnap considers logico-mathematical rules as part of the rules of the language of science. He does not regard mathematics to be another domain of knowledge as opposed to empirical knowledge. The solution he brings to the foundational disputes

for mathematics is to consider mathematics as an instrument of deduction within the field of empirical knowledge rather than as a distinct system of "knowledge". Accordingly it is not the question of truth as warranted belief but of technical expedience. This point of view is also explicit in his *principle of tolerance* (explained in section 2.b). The epistemological question for these logico-mathematical rules as applied in empirical science should be replaced with a pragmatical one.

One of the tasks of *Logical Syntax* is to clarify the role of logico-mathematical part of the language, i.e., the formation and transformation rules of the language of science. Carnap calls the rules of transformation and the rules of formation as *L-rules* of the language. For Carnap, the specification of *analytic sentences* is based on the notion of *L-consequence*, which is an entailment relation based *on L-rules* of the language. This is how the notion of analyticity is related to the role of logicomathematical part of the language of science. Accordingly, the significance of analyticity is not epistemological, since an epistemic notion of analyticity would propose to explain how logic and mathematics is justified. Rather, Carnap aims to clarify the role of logic and mathematics as applied in empirical sciences through the syntactic analysis of the language of science. Hence, the significance of analyticity is functional.

Carnap thinks that the logic of science is the procedure of how scientific reasoning reaches conclusions. In other words, the logic of science inherits the methodology of science. Since the theoretical formulations and derivations are expressed within a language, Carnap thinks that analysis of that language and its applications will provide us with an analysis of theoretical procedures in science (see Carnap (1935) 2-3). In other words, the methodology of science, for Carnap, is inherent in the

language of science. One has to specify the logical structure of the language of science in order to discuss about the methodology of science. According to Carnap the theoretical procedures in science, which form the methodology of science, can be analysed through the syntactic analysis of language of science. The formation and transformation rules of a language, revealed in the syntax language, form the framework of that language, in which objective knowledge of the empirical realm can first be expressed. The formal framework of a language system is a calculus; a system of conventions or rules. The role of formation rules is to determine the conditions under which an expression can be said to belong to a certain category and the role of transformation rules is to determine under what conditions the transformation of one or more expressions into another or others may be allowed. Correspondingly the formal framework of a language is structurally prior to the content of that language. Carnap puts the priority in the structural level, considering the question: which attributes of the language form the basis of which attributes of that language. The specification of L-rules which is the task of the logical syntax (the formal theory of the linguistic forms of the language of science), leads to the specification of the analytic sentences. In sum, the analytic-synthetic distinction is important for methodological discussions. Carnap mentions in each period of his career his belief that "the distinction between analytic and synthetic statements, expressed in whatever terms, is indispensable for methodological and philosophical discussion" (Carnap (1963b) 922).

According to Carnap, there is yet is another task of *Logical Syntax*; that is, the investigation of the nature of the sentences of logico-mathematical systems.

It is one of the chief tasks of this essay to make clear the role of logic and mathematics as applied in empirical science. We shall see that they furnish instruments for deduction, that is, for the transformation of formulations of factual, contingent knowledge. However, logic and mathematics not only apply rules for transformation of factual sentences but they themselves contain sentences of a different, non-factual kind. Therefore, we shall have to deal with the question of the nature of logical and mathematical theorems (Carnap (1939) 2).

We have already explained the former task that Carnap mentions in the quotation above (i.e. the clarification of the role of logic and mathematics as applied in empirical science). The second task of *Logical Syntax*, for Carnap, is to investigate the nature of the sentences of logico-mathematical systems. Despite their role within the language of science, these systems themselves contain sentences of a different form, which can be formulated only within the syntax language (meta-language). For syntax-language, Carnap suggests the formal mode of speech rather than material mode. Since these sentences are stated in the syntax-language (meta-language) they are devoid of factual content due to the formal mode. That is all what Carnap means by the sentences of logico-mathematical systems being non-factual. The object language as the language under investigation is normally formulated in material mode, which can deceive us about the objects of our investigation. Hence the kind of object language to which it is to be referred must first be stated. Accordingly the translation into formal mode of speech will provide the means to discuss the nature of the linguistic expressions. If the formal syntactical mode of speech is used, then linguistic expressions can be discussed. This makes it clear that the language intended must be stated (Carnap (1934) 299).

According to Carnap, the nature of the logico-mathematical part of the language can only be investigated "by translation into a formal mode of speech, or in other words, into syntactical sentences about language and linguistic expression" (Carnap (1934) 299). It seems that for Carnap the language of empirical science, taken as the object language, is naturally expressed in material form (factual/physical form). The transformation from material mode to formal one enables us to realise that mathematical truths are in fact part of the syntactic rules of the language system, rather than a genuine kind of truth about the facts of the world.

In his period of syntax, there is no further epistemological significance to the distinction between analytic and synthetic sentences. In other words, Carnap does not propose that the former is true by virtue of linguistic reasons and the latter by virtue of factual reasons. One should go to a formal level in a metalanguage, to the syntax-language in Carnap's terms, as to make sense of such a distinction, which is *methodological* in its nature. Specification of the analytic sentences is part of the logical specification of the language, which forms the structural basis of that language. According to Carnap, in this period "it depends entirely on the formal structure of the language whether a sentence is analytic or not; or whether one sentence is deducible from another or not" (Carnap (1934) 6). There is a sense that analytic sentences are the ones which are determined by the rules of the language and synthetic ones are indeterminate with respect to the rules of language. However this duality does not coincide with the ways of justification (i.e. a priori vs. a posteriori)

among the sentences of a scientific theory. In the period of syntax, the unit of verification is not a sentence but the theory as a whole. Besides, confirmation of a scientific theory has a holistic structure. Carnap leaves the question of justification to the scientific activity itself:

A sentence of physics, whether it is a P-primitive sentence, some other valid sentence, or an indeterminate assumption (that is, a premiss whose consequences are in course of investigation), will be *tested* by deducing consequences on the basis of transformation rules of the language, until finally sentences of the from of protocol-sentences are reached. These will then be compared with the protocolsentences which have actually been stated and either confirmed or refuted by them. If a sentence which is an L-consequence of certain P-primitive sentences contradicts a sentence which has been stated as a protocol sentence, then some change must be made in the system. For instance, the P-rules can be altered in such a way that those particular primitive sentences are no longer valid; or the protocol sentence can be taken as being non-valid; or again the L-rules which have been used in the deduction can also be changed. There are no established rules for the kind of change which must be made (Carnap (1934) 317).

Up to now, we have tried to explain the sense of analyticity that grounded Carnap's syntactical analysis and concluded that the significance of analyticity in the period of syntax is *methodological* rather than *epistemological*.

The technical success of *LSL* can only be judged once the aim of Carnap's project and the notion of analyticity under examination are both understood properly. As to the former, in section 3.a, it is explained that in *LSL* Carnap does not aim at a foundational investigation for the justification of logico-mathematical systems. For

the latter, at the beginning of this section it is clarified that for Carnap in his period of syntax, analyticity is not an epistemic but a methodological notion.

With this background, it is now possible to analyse how Carnap tries to avoid the results of Gödel's theorems. I agree with Alberto Coffa's comment on Carnap' position:

When Gödel convinced him that proof could not even grasp extensionally the concept of mathematical truth his instinctive reaction was: something else must. The most interesting technical portions of LSL are devoted to the task of explicating this new notion of mathematical truth (Coffa (1987) 549).

As we have already mentioned Carnap was aware of the extension of Gödel's results. Hence in LSL he was not after to demonstrate how all mathematical truths can be justified in terms of provability which is a hopeless project. It is as if Carnap tries to analysis. Gödel's theorem upside down for his syntactical If turn logical/mathematical validity (truth) is not grounded on what is demonstrable (provable), it should be grounded on something else. Carnap warns us that he does not aim to discover "a definite criterion of validity - that is to say, a criterion of a kind such that the question of its fulfilment or non-fulfilment could in every individual instance be decided in a finite number of steps by means of a strictly established method" (Carnap, (1934) 98). Because he thinks that "If a criterion of this kind were discovered we should then possess a method of solution for mathematical problems; we could, so to speak, calculate the truth or falsehood of every given sentence, for example, of the celebrated Theorem of Fermat" (Carnap (1934) 99). Carnap's insight was his recognition that proof (derivability) and consequence must then be different concepts. If the sentences of logico-mathematical

systems cannot be shown to be provable then a new concept "logical consequence" must be explicated within syntax to secure that those sentences are analytic.⁴ In this way, "analytic" does not coincide with "demonstrable". Accordingly, Carnap introduces:

the term 'consequence', which is wider than the term 'derivable', and analogously, the term 'analytic', which is wider than 'demonstrable', and the term 'contradictory', which is wider than 'refutable' (Carnap (1934) 37).

By means of the concept 'analytic', an exact understanding of what is usually designated as 'logically valid' or 'true on logical grounds' is achieved. Hitherto it has for the most part been thought that logical validity was representable by the term 'demonstrable' – that is to say, by a process of derivation. But although, for the majority of practical cases, the term 'demonstrable' constitutes an adequate approximation, it does not exhaust the concept of logical validity (Carnap (1934) 41).

Carnap proposes a criterion of validity depending on what he calls method of *consequence*; that is, "a method of deduction which depends upon indefinite individual steps, and in which the number of premises need not be finite" (Carnap (1934) 100-101). Carnap asserts that in the case of a method of this kind, we operate, not with sentences but with sentential classes, which may also be infinite. Let us now try to analyse his conception of logical consequence, together with his definition of analyticity.

⁴ I believe that, for Carnap, the concept of truth is an epistemic notion, which has to be explicated with a reference to other notions like justification or provability. That's why Carnap uses the term 'analytic' rather than 'true'. Correspondingly, he chooses the concept, "logical consequence" for the

2.d The Notion of Logical Consequence

Before going on I shall remark that in LSL, both of the languages, I and II, are Llanguages, which means that consequence relation coincides with logical consequence (L-consequence). Accordingly Carnap just defines L-consequence relation for both of these L-language systems. For P-languages, consequence relation must be more general concept because these language systems also include P-rules. However, Carnap does not explicate a general concept of consequence within his analysis (especially for general syntax) and seems to assume that it is understood.

For language I, which is a simple language system, Carnap first defines logical consequence by means of the expansion of the inference rules of classic logic. He then defines analytic, contradictory and synthetic based on the notion of logical consequence as follows: "A sentence S_1 is called *analytic* (in I) when it is a consequence of the null class of sentences (and thus a consequence of every sentence); it is called *contradictory* when every sentence is the consequence of S_1 ; it is called *L*-determinate when it is either analytic or contradictory; it is called *synthetic* when it is neither analytic nor contradictory" (Carnap (1934) 39-40).

For language II Carnap informs us that "we shall, for technical reasons, do just the reverse: first we shall define 'analytic' and 'contradictory' " (Carnap (1934) 102). In addition, Carnap announces that "we shall define the term 'analytic' in such a way that it is applicable to all those sentences, and only to those sentences, of Language II that are valid (true, correct) on the basis of logic and classical mathematics" (Carnap

explication of analyticity rather than provability. In the following section, 2.e., I will examine the notion of truth in Carnap's *Logical Syntax*.

(1934) 100-101). Accordingly he defines analytic and contradictory as based on the notions "reduction" "valuation" and "evaluation".

Reduction, for Carnap is a procedure to transform sentences into simpler forms. Every sentence of language II must first univocally be transformed into a certain (usually simpler) standard form by means of reduction. Hence, a sentence is called reduced when none of the rules of reduction can be applied to it. A sentence is logical, reduced and closed when it has the sentential form that has no operators but does contain free variables inside.

For a simple form of a reduced sentence which contains a lesser number of variables, Carnap shows that the numerical variable can be eliminated by referring to the infinite sentential class. "If z_1 , for example, occurs as a free variable in S_1 then we shall call S_1 analytic when and only when all sentences of the form S_1 (z_1 S_t) are analytic; thus we refer for instance from $P_1(x)$ to sentences of the infinite sentential class { $(P_1(0)', (P_1(0')', (P_1(0'')', ...))^{"}$ (Carnap (1934) 106). Carnap reminds that in case that of a predicate --or functor-variable, the analogous method does not succeed; a fact which has been pointed out by Gödel. "As a result of Gödel's researches it is certain, for instance, that for every arithmetical system there are numerical properties which are not definable" (Carnap (1934) 106). Thus Carnap thinks that we must proceed in a different way rather than referring to substitutions. Let S₁ be, for example 'M(F)' (in other words: "M is true for all properties"). Now, says Carnap, if from S_1 we refer back to the sentences 'M(P₁)', 'M(P₂)', and so on, which result from S_1 by substituting for 'F' each of the predicates of the type in question which are definable in II, in turn, then it may happen that, though all these sentences are true, 'M(F)' is nevertheless false - in so far as M does not hold for a certain property

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for which no predicate can be defined in II. Instead, Carnap proposes to follow Gödel's suggestions and define 'analytic' in such a way that 'M(F)' is only called analytic if M holds for every numerical property irrespective of the limited domain of definitions which are possible in II. Correspondingly, for a possible valuation (syntactical designation, B) for 'F' (i.e. a value assigned to 'F') Carnap considers a class (that is to say, a syntactical property) of accented expressions. Accordingly, " if B₁ is a particular valuation for 'F' of this kind, and if at any place in S₁ 'F' occurs with St₁ as its argument (for example, in partial sentence 'F(0")'), then this partial sentence is – so to speak – true on account of B₁, if St₁ is an element of B₁, and otherwise false" (Carnap (1934) 107). Finally evaluation is the process of applying the rules of valuation.⁵ For instance, by the evaluation of S₁ on the basis of B₁ Carnap considers a transformation of S₁ in which the partial sentence mentioned is replaced by R if St₁ is an element of B₁, and otherwise by ~R.

Carnap's definition of analytic for language II is too complicated to be summarised here without long and troublesome explanations. Therefore I will rather refer to his own words for the idea behind his construction:

The definition of 'analytic' will be so framed that S_1 will be called analytic if and only if every sentence is analytic which results from S_1 by means of evaluation on the basis of any valuation for 'F'. And S_1 will be contradictory when at least one of the resulting sentence is a contradictory sentence (Carnap (1934) 107).

Finally Carnap defines logical consequence as follows:

⁵ The technical elaboration of "valuation" and "evaluation" is out of the scope of this thesis. But I shall remark that Carnap's conception of "valuation" follows the similar lines with that of Tarski!s conception of "satisfaction".

A sentence is (in material interpretation) a logical consequence of certain other sentences if, and only if, its antithesis is incompatible with these sentences. Hence we define as follows: S_1 is called a consequence of R_1 in II, if $R_1 + \{\sim ()(S_1)\}$ is contradictory (Carnap (1934) 117).

For our further discussions, I shall appeal to Alfred Tarski's interpretation of Carnap's definition in his paper "On the Concept of Logical Consequence", since he formulates it in the same way as Carnap does but in a simpler manner:

The definition proposed by Carnap can be formulated as follows:

The sentence X follows logically from the sentences of the class K if and only if the class consisting of all the sentences of K and of the negation of X is contradictory (Tarski (1936) 414).

Within the named article, Tarski himself also gives a similar definition of the concept of logical consequence, without any appeal to the concept of "contradiction", which he calls as the decisive element in Carnap's definition. Despite this difference, the main idea behind Tarski's construction of the definition of logical consequence is similar to that of Carnap as Tarski himself also mentions:

Incidentally I should like to remark that the definition of the concept of consequence here proposed does not exceed the limits of syntax in Carnap's conception. Admittedly the general concept of satisfaction (or of model) does not belong the syntax; but we use only a special case of this concept – the satisfaction of sentential functions which contain no extra-logical constants, and this special case can be characterised using only general logical and specific syntactical concepts. Between the general concept of satisfaction and the special case of this concept used here approximately the same relation holds as between the

semantical concept of true sentence and the syntactical concept of analytic sentence (Tarski (1936) 418, ft.1).

Let us continue with Tarski's definition of logical consequence. Tarski first assumes that the extra-logical constants (in Carnap's terms, descriptive terms) occurring in a language can be replaced with corresponding variables, in such a way that every sentence becomes a sentential function. Let L be any class of sentences. When all the extra-logical constants which occur in the sentences of L are replaced with correspondence variables, we obtain a class L' of sentential functions. Tarski calls an arbitrary sequence of objects which satisfies every sentential function of the class L' as a model. Here I shall remark that the special concept of satisfaction as to formulate a model is what Carnap calls as "valuation". Finally, Tarski defines the concept of logical consequence as follows:

The sentence X follows logically from the sentences of the class K if and only if every model of the class K is also a model of the sentence X (Tarski (1936) 417).

A class of sentences which posses no model can be called *contradictory* in Carnap's sense. In this way, says Tarski, the proposed definition can be reconciled with that of Carnap. Analogously, a class of sentences can be called analytical if every sequence of objects is a model of it. Furthermore, Tarski also agrees that it is possible to show "– just as does Carnap – that those and only those sentences are analytical which follow from every class of sentences" (Tarski (1936) 418).

In the result of the above discussions, Tarski still has concerns about the material adequacy of the definition of logical consequence. Underlying the whole construction is the division between all of the terms of the language into logical and
extra-logical. Tarski mentions that although such a division is not quite arbitrary, no objective grounds, which permit us to draw a sharp boundary between the two groups of terms, are yet known. Thus, according to Tarski, we shall be compelled to regard such concepts as 'logical consequence', 'analytic statement', and 'tautology', as relative concepts which must, on each occasion, be related to a definite, although in greater or less degree arbitrary, division of terms into logical and extra-logical. This distinction is not relative in the same sense as other semantic notions. A semantic notion, for instance "truth", is relative to the language under investigation. However, the notion of analyticity is relative to the distinction between logical and extra-logical terms made in the object language. Even if we can name each term of the object language logical or extra-logical in the meta-language, this will still intuitively depend on a presupposed distinction made among the terms of the object language.

Accordingly, Carnap's selection of syntactic properties also depends on the selection of logical expressions. In this way the analytic-synthetic distinction depends on a distinction between logical and extra-logical (descriptive) expressions of a language. As Tarski points out, there is not an objective way to distinguish logical from extralogical terms. It seems that Carnap tries to clarify the distinction between the logical and the descriptive terms with the transition process from the material mode of speech to the formal mode. For instance Carnap translates the sentence: "The moon is a thing; five is not a thing, but a number" which is given in material mode of speech, into formal mode of speech as follows: " 'Moon' is a thing-word (thingname); 'five' is not a thing-word, but a number-word." Although Carnap gives some examples of how this transition is done, he does not provide us with any criterion as to how the distinction between descriptive and logical terms is made. According to Carnap, such a distinction is a convention based on the characteristics of the language under investigation. Therefore, Carnap also admits that it is relative both to the language system under investigation and to the transition procedure. However, for Tarski, the problem is not that the distinction is relative to a language system. Indeed, semantic notions such as "truth" and "satisfaction" are also language relative. The problem is that one can not provide a materially adequate definition of the distinction between logical and extra-logical terms.

Despite the difficulties mentioned, once the analytic-synthetic distinction is put in terms of a distinction between the linguistic features of the terms, i.e. logical versus extra-logical, it does not point to an epistemic distinction in the origins of justification. Correspondingly, in LSL, analytic-synthetic distinction does not carry any epistemic significance in terms of justification. It is not a difference in the reasons for one's warrant for the truth of a statement. Carnap clearly avoids an epistemic dualism among sentences i.e. true by virtue of linguistic reasons versus true by virtue of factual reasons, with respect to the analytic-synthetic distinction. The distinction has a structural significance and it is made in the meta-level, in the syntax language, based on the logical and extra-logical distinction among the terms of the language. However, there is not a materially adequate definition of the distinction between logical and extra-logical terms. And this is exactly what the problem of analytic/synthetic distinction actually boils down to.

I believe that Carnap's conception of analyticity is problematic for the reasons given above. But I think this does not directly follow from Gödel's incompleteness

theorem, which would be a problem for Carnap if he had followed a foundational project for the justification of mathematical truths, which is not the case.⁶

I shall now examine why Carnap avoids reffering to the notion of truth in LSL, in order to support our conclusion that Carnap's aim in LSL is not to give an answer to the classical question of epistemology; how is justification possible? and in this sense, his notion of analyticity does not have an epistemic significance.

⁶ Although Friedman also narrows the problem to the obscurity of the distinction between logical and descriptive terms, he then concludes that this is the reason why Carnap's conception of analyticty is incompatible with Gödel's theorem. As opposed to Friedman, Goldfarb and Ricketts argue that Friedman assimilates Carnap's view to a foundational project. On the one hand, I agree with Goldfarb and Rickett that if one concludes that Carnap's conception is undercut by Gödel's theorem, one should have imposed a foundational role to Carnap's position. On the other hand, although I think that Gödel's theorem does not apply to Carnap's view, still I agree with Friedman that there is yet a problem with Carnap's conception, i.e., the problem of giving a materially adequate definition of the distinction between the logical and the extra-logical expressions.

2.e The Notion of Truth in Syntax

It is generally discussed why Carnap avoided using the term "true" in his syntactic analysis. Some⁷ believe that Carnap thought that "truth" was a pseudo-concept and that is why it was not a proper concept for syntactic analysis. Others claim that Carnap didn't realise that there could be a semantic definition of truth. Neither of these presents Carnap's position adequately.

As opposed to the former view, for Carnap, truth is not a pseudo-concept, but a scientific one. And it is the task of empirical investigations to find out which sentences of the object language must be taken as true; and it is the task of logical analysis to show how other sentences are derived from those sentences (which have already been decided to be true). Certainly Carnap would not allow any metaphysical notion of truth within his system but from this it doesn't follow that he abandons the notion of truth completely.

Let us pay attention to why Carnap himself thinks that the term "true" cannot be defined in syntax:

Given any language-system, or set of formation rules and transformation rules, among the sentences of this language there will be true and false sentences. But we cannot define the terms "true" and "false" in syntax, because whether a given sentence is true or false will generally depend not only upon the syntactical form of the sentence, but also upon experience; that is to say, upon something extralinguistic (Carnap (1935) 47-48).

⁷ See Coffa (1991) and Creath (1990). Coffa attributes a stronger verificationism to Carnap's view than Creath does. Still, in different strengths, they both argue that Carnap rejected the notion of truth to avoid metaphysics.

Carnap admits that there will be true and false sentences within an object language. But the reason why one ascribes a truth-value to a sentence depends on both linguistic structure of that sentence and experience, which can not be properly distinguished within syntax. I think the key reason why Carnap avoids using the term 'true' as a predicate in syntax is simply because Carnap takes truth as an epistemic notion. He probably thinks that an adequate definition of truth given in a metalanguage (syntax-language) should also capture the epistemic criterion of truth ascription in the object language. Carnap also thinks that such a definition is not possible within syntax-language.

Recall that Tarski's definition of truth does not either illuminate the epistemic criterion of truth in the object language. It is neutral towards any epistemic explanation for the assent to a sentence in the object language. Tarski's semantic conception of truth as disquotation is compatible with Carnap's syntactic concept of analytic in *Logical Syntax*.

Furthermore, Carnap says that the term 'true' can be used as a predicate in a syntaxlanguage referring to the sentence of an object language. After discussing the paradoxes that arise when the predicate 'true' is used to apply to sentences of a language within that language itself Carnap says:

This contradiction only arises when the predicates 'true' and 'false' referring to sentences in a language S are used in S itself. On the other hand, it is possible to proceed without incurring any contradiction by employing the predicates 'true (in S)' and 'false (in S)' in a syntax of S which is not formulated in S itself but in another language (Carnap (1934) 216).

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However Carnap thinks that this is philosophically uninteresting since the use of 'true' as a predicate in a metalanguage does not provide any illumination to the concept of truth itself. What bothers Carnap is that "a theory of this kind formulated in the manner of a syntax would nevertheless not be a genuine syntax" since it would be using a concept, i.e. "truth", which is not definable with syntactical terms:

For truth and falsehood are not proper syntactical properties; whether a sentence is true or false cannot generally be seen by its design, that is to say by the kinds and serial order of its symbols. (This fact has usually been overlooked by logicians, because, for the most part, they have been dealing not with descriptive but only with logical languages, and in relation to these, certainly, 'true' and 'false' coincide with 'analytic' and 'contradictory', respectively, and are thus syntactical terms) (Carnap (1934) 217).

The language that Carnap tries to analyse with respect to its syntactic properties is a descriptive language rather than merely a logical one. Accordingly, he considers that the sentences of such a language will be true on the basis of both linguistic and non-linguistic, factual, reasons. One's method of justification taken as an epistemic criterion of truth can not be explicated within syntax. Since a definition of truth that must capture the epistemic criterion of truth cannot be given within syntax, Carnap thinks that 'true' is not a syntactic term.

The second view considering Carnap's conception of truth was that Carnap didn't realise that there could be a semantic definition of truth. Remember that Carnap's concept of valuation is quite close to Tarski's conception of satisfaction. However, he restricts the use of valuation to the syntactic properties. Carnap didn't think that this could be a basis for an adequate definition for truth in general. I have already

argued that for Carnap the concept of truth had an epistemic significance, which an adequate definition should also capture. However, epistemic criterion of truth with full correspondence to its use in object language can not be defined within syntax. Hence within his syntactic analysis Carnap prefers to drop the use of the term 'true', rather than changing his understanding of adequate definition. Tarski's important contribution is his insight for what an adequate definition should be.

There is a sense in which Carnap missed the point here, that is; to realise that an adequate definition of truth need not be concerned with epistemic criterion for truth. But with respect to analytic-synthetic distinction, since Carnap avoids putting the distinction in terms of truth, which is an epistemic notion in his terminology, he also avoids setting the distinction in terms of epistemic concerns.

It follows that if our interpretation of Carnap's understanding of the concept of truth is relevant (i.e "truth", for Carnap, is an epistemic notion) then this explains why Carnap avoids to use the concept of truth within his syntactic analysis. This also supports our previous conclusion that analytic-synthetic distinction in his period of syntax does not point to a distinction in the methods of justification, i.e, true by virtue of linguistic reasons versus true by virtue of factual reasons.

3. On Truth by Convention

In this section, I will analyse whether Quine's arguments against the significance of analyticity in "Truth by Convention" should be considered as an objection to Carnap's conception of analyticity in his period of syntax. To this end I will first analyse Quine's paper and then make a comparative analysis on the possible agreements and disagreements between Quine and Carnap.

3.a Quine on Truth by Convention

At the very beginning of "Truth by Convention", Quine raises his anxiety about the role of *definitions* that gained the status of *analytic principles* within science as follows: "what was once regarded as a theory about the world becomes reconstrued as a convention of language" (Quine (1935) 77). The primary aim of his inquiry, as Quine puts it, is to question the sense of the thesis that logic and mathematics are purely analytic or conventional, rather than to question the validity of this conviction.

... developments of the past few decades have led to a widespread conviction that logic and mathematics are purely analytic or conventional. It is less the purpose of the present inquiry to question the validity of this contrast than to question its sense (Quine (1935) 77).

A brief outline of Quine's reasoning is as follows: The thesis that mathematics is purely analytic or conventional may mean:

A. Mathematics is part of logic, that is; "the definitions of mathematical expressions can so be framed on the basis of logical ones that all mathematical truths become abbreviations of logical ones" (Quine (1935) 79). Hence mathematics becomes conventional transcriptions of logical truths. B. Mathematics is not part of logic, that is; "some mathematical expressions resist definition on the basis of logical ones" (Quine (1935) 83). Hence mathematics can not be reduced to logic. Mathematics itself can be taken to be conventional like logic.

For the former case, A, Quine claims that: " If for the moment we grant that all mathematics is thus definitionally constructible from logic, then mathematics becomes true by convention in a relative sense: mathematical truths become conventional transcriptions of logical truths... But in the strict sense we cannot regard mathematics as true purely by convention unless all those logical principles to which mathematics is supposed to reduce are likewise true by convention" (Quine (1935) 87).

Quine, then, analyses how logic can be regarded as conventional. According to him, the idea of *linguistic convention* is what underlies the claim that logic is conventional. There can be many ways of framing the definitions, all of which conforms to the same usage of expressions in question and the choice among them may just be convenience. Hence different choices involve different sets of primitives, which form the basis of logical principles. All further logical notations become construed as abbreviations of statements whose logical constituents are limited to those primitives. Accordingly, "circumscription of our logical primitives in point of meaning, through conventional assignment of truth to various of their contexts, has been seen to render all logic true by convention" (Quine (1935) 98).

If this is what one means by his conviction that logic is conventional, says Quine, it follows that mathematics is also true by convention respectively once we grant the former thesis that mathematics can be reduced to logic.

For the latter case, B, the thesis that mathematics is not reducible to logic, Quine says that mathematics itself can be formulated to be conventional through circumscription of primitives likewise logic.

If on the other hand, contrary to the thesis that mathematics is logic, some mathematical expressions resist definition in terms of logical ones we can extend the foregoing method into the domain of these recalcitrant expressions: we can circumscribe the latter through conventional assignment of truth to various of their contexts, and thus render mathematics conventionally true in the same fashion in which logic has been rendered so (Quine (1935) 98).

However, Quine observes that this method can even be carried beyond mathematics, into the so-called empirical sciences. We can also circumscribe "empirical" primitives in the same way that of mathematical/logical primitives and finally science then becomes true by convention precisely in the same manner as does mathematics (see Quine (1935) 100).

In the light of these investigations Quine concludes that:

If in describing logic and mathematics as true by convention what is meant is that the primitives can be conventionally circumscribed in such a fashion as to generate all and only the accepted truths of logic and mathematics, the characterization is empty; our last considerations show that the same might be said of any other body of doctrine as well. If on the other hand it is meant merely that the speaker adopts such conventions for those fields but not for the others, the characterization is uninteresting; while if it is meant that it is a general practice to adopt such conventions explicitly for those fields but not for others, the first part of the characterization is false (Quine (1935) 102).

The only characterization, for Quine, which is perhaps neither empty nor uninteresting nor false is the thesis that "logic and mathematics may be held conventional while other fields are not; it may be held that it is philosophically important to circumscribe the logical and mathematical primitives by conventions of truth assignment but that it is idle elaboration to carry the process further" (Quine (1935) 102-103).

Quine thinks that the thesis of conventionality is tenable only if it is restricted to the field of mathematics. But Quine warns us that there is still a technical problem that is the possibility of infinite regress. The derivation of the truth of any specific statement requires a logical inference and this involves us in an infinite regress in the adoption of conventions to set up logic itself. In sum, says Quine, "the difficulty is that if logic is to proceed mediately from conventions, logic is needed for inferring logic from the conventions". One way to avoid this problem is to consider that "the verbal formulation of conventions is no more a prerequisite of the adoption of the conventions than the writing of a grammar is a prerequisite of speech; that explicit exposition of conventions is merely one of many important uses of a conceptual language. So conceived, the conventions no longer involve us in vicious regress" (Quine (1935) 105) According to Quine, construed in this way, the thesis that mathematics and logic are conventional loses its explanatory power.

Such an account, for Quine, indeed accords well with what we actually do: "We discourse without first phrasing the conventions; afterwards, in writing such as this, we formulate them to fit our behaviour" (Quine (1935) 105). Hence, for Quine, our "linguistic behaviour" is prior to phrasing these conventions. Because Quine thinks that when a convention is incapable of being communicated until after its adoption,

its role is not so clear. And without the attribute of explicitness the notion of linguistic convention fails to have any explanatory power. Accordingly, for the significance of the claim that logic or mathematics is true by convention, Quine argues that it is no more explanatory than those of other doctrines, one of which is Kant's conception of a priori:

We may wonder what one adds to the bare statement that truths of logic or mathematics are a priori, or to the still barer behaviouristic statement that they are firmly accepted, when he characterizes them as true by convention in such a sense (Quine (1935) 106).

3.b Carnap vs. Quine on Truth by Convention

I will question the sense of Quine's target likewise Quine himself questions the sense of the thesis that logic and mathematics are analytical or conventional. Hence my aim is to clarify the notion of convention against which Quine's arguments are so forceful. It will then be possible to analyse whether Quine's objections are in fact a rejection of Carnap's doctrine of analyticity (in the period of syntax). With an analogy to the distinct notions of analyticity given in the previous section, our question is; which notion of convention is Quine's target: *methodological* or *epistemological*?

Quine first maintains that *conventional make-belief* cannot explain the contrast between logico-mathematical truths and others since such a method can be carried beyond the scope of mathematics into the empirical sciences. For Quine, the apparent contrast is expressed by Kant as the former being *a priori* and the *latter a posteriori*. The so-called truths of logic and mathematics, says Quine, "are destined to be maintained independently of our observations of the world" (Quine (1935) 102), and are thus called "a priori". Accordingly, for these statements of logic and mathematics, Quine questions whether the technique of conventional truth assignment can really forestall awkward metaphysical questions as to our a priori insight into these truths. In the quotation given at the end of previous section, Quine is skeptic about what more one can add to the bare statement that truths of logic or mathematics are a priori, when he characterizes them as true by convention. Apparently, Quine questions the *epistemic significance* of the thesis. For him, regarding mathematical statements as true by convention does not bring any further explanation for their justification from that of calling them a priori.

In the root of his objections, Quine thinks that "convention" does not explain the special status of warrant for mathematical truths as opposed to empirical justification. Quine observes that a similar conventional explanation is also applicable to the formation of some other beliefs within the empirical sciences. For this reason one can not provide a special epistemic status for mathematical truths by calling them *true by convention*. If there can be conventions within empirical sciences and if the justification of empirical beliefs depends on experience, then the doctrine of convention, replacing that of a priori, can not work as an epistemic explanation for the warrant of mathematical statements as opposed to empirical (a posteriori) justification. In a word, the thesis of convention can not distinguish mathematical truths from empirical truths with respect to their ways of justification.

Under the considerations above, it is clear that Quine questions the legitimacy of the *epistemological* significance of convention rather than *methodological*. This is also explicit in his characterization of the so-called contrast between a priori and a posteriori:

Viewed behavioristically and without reference to a metaphysical system, this contrast retains reality as a contrast between more or less firmly accepted statements; and it obtains antecedently to any *post facto* fashioning of conventions. There are statements which we choose to surrender last, if at all, in the course of revamping our sciences in the face of new discoveries; and among these there are some which we will not surrender at all, so basic are they to our whole conceptual scheme (Quine (1935) 102).

In the quotation above, we find the first signs of Quine's epistemological approach that underlies "Two Dogmas of Empiricism". From his perspective, the contrast between "a priori" and "a posteriori" is between more or less firmly accepted statements. Some of them can be abandoned in the face of new discoveries to improve our science, while others can be so basic that we will not surrender them at all. However, such a distinction does not rest on being conventional or not. In sum, Quine's objection is against the thesis of convention that is proposed to carry an epistemic significance in terms of justification.

The answer to the question whether "Truth by Convention" is an objection to Carnap depends on whether Carnap's notion of analyticity refers to any notion of "truth by convention" as an epistemological explanation. Our former investigations have shown that in the period of syntax Carnap's conception of analyticity does not point to an epistemic significance in terms of warrant. Carnap tries to formulate a notion of analyticity, which has a methodological significance for the linguistic structure of science. Besides it has been argued that Carnap avoids using the term 'true' within his syntactic analysis because he thinks that truth is an epistemic notion. It is an irony that though Carnap avoids using the concept of truth in his syntax as to avoid the

notion of *truth by convention*, some commentators take Quine's paper, "Truth by Convention", as a direct denial of Carnap's conception of analyticity.

According to Carnap, the question of justification for the sentences of empirical sciences is proper to science itself, rather than philosophy. As mentioned before, Carnap divides the questions of traditional epistemology into two: psychological and logical questions, and narrows down his new epistemology to the logic of science, which can be formulated through the analysis of logical syntax of language. With respect to the logical analysis of physics, as part of the logic of science, Carnap says:

The logical analysis of physics – as part of the logic of science – is the syntax of the physical language. All the so-called epistemological problems concerning physics (in so far as it is not a question of metaphysical pseudo-problems) are in part empirical questions, the majority of which belong to psychology, and in part logical questions which belong to syntax (Carnap (1934) 315).

As far as the logic of science is concerned with the syntactical analysis of scientific language, in LSL, Carnap does not deal with the question of justification in the foundational sense i.e. the warrant for accepting a belief.

Nevertheless at the end of LSL, Carnap gives his general view for the method of justification of physical theories as follows:

A sentence of physics, whether it is a P-primitive sentence, some other valid sentence, or an indeterminate assumption (that is, a premiss whose consequences are in course of investigation), will be *tested* by deducing consequences on the basis of transformation rules of the language, until finally sentences of the form of protocol-sentences are reached. These will then be compared with the protocolsentences which have actually been stated and either confirmed or refuted by them. If a sentence which is an L-consequence of certain P-primitive sentences contradicts a sentence which has been stated as a protocol sentence, then some change must be made in the system. For instance, the P-rules can be altered in such a way that those particular primitive sentences are no longer valid; or the protocol sentence can be taken as being non-valid; or again the L-rules which have been used in the deduction can also be changed. There are no established rules for the kind of change which must be made (Carnap (1934) 317).

According to Carnap the rules of the physical language have the character of *hypotheses* in relation to the protocol sentences. Hence confirmation is the agreement of L-consequences of the hypothesis with the protocol sentences. However, Carnap warns us that there is no final confirmation in this procedure. Furthermore he also emphasizes the holistic structure of this confirmation:

Further, it is, in general, impossible to test even a singular hypothetical sentence. In the case of a single sentence of this kind, there are in general no suitable Lconsequence of the suitable form of protocol-sentences; hence for the deduction of sentences having the form of protocol-sentences the remaining hypotheses must also be used. Thus the test applies, at bottom, not to a single hypothesis but to the whole system of physics as a system of hypotheses (Carnap (1934) 318).

Quine also indicates a similar point in "Truth by Convention" when he says: "There are statements which we choose to surrender last, if at all, in the course of revamping our sciences in the face of new discoveries; and among these there are some which we will not surrender at all, so basic are they to our whole conceptual scheme" (Quine (1935) 102). In this period, Carnap supports even a stronger epistemic holism than Quine does since Carnap argues that even L-rules can be altered.

No rule of the physical language is definitive; all rules are laid down with the reservation that they may be altered as soon as it seems expedient to do so. This applies not only to the P-rules but also to the L-rules, including those of mathematics. In this respect, there are only differences in degree; certain rules are more difficult to renounce than others (Carnap (1934) 318).

Carnap's view can not be Quine's target because Carnap does not promise to provide any epistemic explanation that Quine asks for the distinction between mathematical truths and empirical truth in terms of warrant. In addition their views for the confirmation of physical theories are both holistic. Hence I conclude that in the period of syntax Carnap's view is compatible with that of Quine on epistemology as the warrant of scientific claims.

Finally we shall examine the status of convention within Carnap's philosophy in his period of syntax. What are the limits of convention and its significance within Carnap's syntax?

The construction of the physical system is not effected in accordance with fixed rules, but by means of conventions. These conventions, namely, rules of formation, the L-rules, and the P-Rules (hypothesis), are, however, not arbitrary. The choice of them is influenced, in the first place, by certain methodological considerations (for instance, whether they make for simplicity, expedience, and fruitfulness in certain tasks). This is the case for all conventions, including for example definitions. But in addition the hypotheses can and must be tested by experience, that is to say, by protocol sentences – both those that are already stated and the new ones that are constantly being added. Every hypothesis must be compatible with the total system of hypotheses to which already recognized protocol sentences also belong. That hypotheses, in spite of their subordination to

empirical control by means of the protocol sentences, nevertheless contain a conventional element is due to the fact that the system of hypotheses is never univocally determined by empirical material, however rich it may be (Carnap (1934) 320).

As the quotation above shows, Carnap does not only think that the method of convention *can be* carried beyond mathematics into the so-called empirical sciences, indeed he thinks that this is actually the case. Nevertheless, Carnap does not impose any epistemic role to convention in order to provide any answer to the question of justification. Confirmation of physical theories, for Carnap, depends on experience. Theories of physics are tested empirically in a holistic manner. Nevertheless convention is important in the methodological sense for the construction of a scientific theory.

Carnap tries to make a methodological analysis of science through the syntactical analysis of scientific language. For Carnap mathematics is part of the calculus of language of empirical science. Carnap does not consider logico-mathematical systems as a different branch of knowledge but takes it as *part* of the syntactical framework of scientific language. Syntax language is the meta-language in which formation and transformation rules of an object language can be formulated. Formation and transformation rules are important in the methodological sense for the construction of a language. These postulates are prior to the content of the language. Meaningful sentences about the empirical realm can only be expressed through implementation of these rules. One need not be foundationally justified to adopt these rules. They are conventions. They are hypothetically assumed to make scientific assertions, which are finally tested by experience. In addition, falsification

of a deduced consequence entails not the falsity of a definite postulate, but the inconsistency of a set of postulates. In this way, even an L-Rule can be altered.

As mentioned before, for Carnap, there can be two types of transformation rules for a language system: L-rules (logical) and P-rules (physical). Since P-rules are also part of the transformation rules they too have a methodological significance like L-rules. Methodologically P-rules must also be presupposed before any other empirical assertion can be made. Hence Carnap does not propose a distinction between L- rules and P-rules even in the methodological sense. As far as they are part of transformation rules they share the same methodological status with that of L-rules.

However we are still left with the question: how is the distinction between L-rules and P-rules established? Carnap warns us that such a difference does not directly coincide with the difference between logical and descriptive sentences. In his formulation Carnap first assumes a distinction among the expressions of a language: logical and descriptive. L-consequence is defined in such a way that it is a consequence relation between the sentences based only on the role of logical expressions occurring in them. P-consequence depends on the role of both logical and descriptive expressions. Although L-rule and P-rule distinction does not coincide with logical and descriptive distinction, the latter distinction still underlies the former. Hence, one needs to appeal to a distinction between L-rules and P-rules. As mentioned before, Carnap does not provide us with any satisfactory criterion for this substantial distinction between logical and descriptive expressions of a language system. Quine questions the sense of the thesis of convention as an explanation to the distinction between mathematical truths and empirical truth in terms of warrant. However, Carnap does not promise to provide any epistemic explanation that Quine asks for. Carnap's conventionalism is not a proposal for justification of mathematical truths. Conventions are important in the methodological sense since they are the primitive rules which construct the framework of a language in which any further meaningful sentence can be expressed. Moreover, Carnap's thesis of convention does not also distinguish between the logical and the empirical, since among the transformation rules of a language there can also be P-rules. According to Carnap, "whether in the construction of a language S we formulate only L-rules or include also P-rules, and, if so, to what extent, is not a logico-philosophical problem, but a matter of convention and hence, at most, a question of expedience" (Carnap (1934) 180).

It seems that this is one of the crucial points where Carnap and Quine diverge. Quine thinks that convention does not carry any philosophical significance since it can not explain the distinction between logico-mathematical truths and empirical truths. Carnap, on the other hand, seems to think that it is still important for the analysis of science. More explicitly it is important to clarify the logic of science for methodological discussions of science.

There is another point Quine raises, which may indicate another divergence from Carnap's philosophy. According to Quine, if one still wants to propose the thesis of convention in a significant way one should consider that only logical/mathematical truths can be held conventional while other truths cannot. Quine points out that even in such a case, conventions are settled down in accordance with our "behavioural expositions". Hence, for Quine, our linguistic behaviour is prior to phrasing logical conventions. Once one allows for the possibility that conventions are settled beforehand, they stop being explicit. Quine thinks that when a convention is incapable of being expressed until after its adoption, its role is not so clear.

However, Carnap would agree that the role of the conventions and their success can only be judged after their adoption, depending on the consequences they lead to. Then the difference between Quine and Carnap depends on their conception of *logic*. Quine thinks that there is only one logic, which can be phrased explicitly by investigating our behavioural communication.⁸ Carnap, as opposed to this view, thinks that there may be alternative logical systems because Carnap believes that "it might be that a system deviating from the ordinary form will turn out to be useful as a basis for the language of science" (Carnap (1939) 29).

In sum the difference between them concerns two issues: the philosophical significance of convention and pluralism in logic. Despite these two concerns, it has been clarified that in terms of methods of justification for scientific theories both philosophers are holists. Hence I conclude that based on the textual evidence that have been mentioned so far, in the period of syntax Carnap's epistemological views (for one's justification of scientific claims) is compatible with that of Quine. However it should be noted that these philosophers had a further close communication and probably extended their discussions beyond writings. Although their difference of opinion explicitly first appears in "Two Dogmas of Empiricism" probably it has its roots in these discussions.

In his period of syntax Carnap carefully avoids any notion of "truth by convention" that has an epistemic significance in terms of justification. However Carnap's enthusiasm about semantics as supplementation of syntax can be seen as a sign of a desire to explicate the epistemic notion of analyticity without sliding into metaphysics or psychology. Semantics, thought Carnap, could provide the means for explicating the notion analyticity that would also have an epistemic significance. This is the topic of the following section.

⁸ In recent discussions, Quine's criticism is reformulated as the tension between Carnap's principle of tolerance (logical pluralism) and his desire for explicitness of the syntactical rules (explicitness of logic). See Richardson (1994).

4. Carnap's Period of Semantics

4.a The Close Connection between Semantics and Epistemology

In Carnap's philosophy, semantics appears to be an important step for his language analysis as a supplementation of syntax. But in what sense semantics is important as a supplement to syntax? Carnap gives an answer to this question in "Testability and Meaning". In the introduction part, Carnap explains how the question of meaning (semantics) and the question of verification (epistemology) have one and the same answer from the point of view of empiricism. This is made possible on the basis of *the verification theory of meaning*.

Two chief problems of the theory of knowledge are the question of meaning and the question of verification. The first question asks under what conditions a sentence has meaning, in the sense of cognitive, factual meaning. The second one asks how we get to know something, how we can find out whether a given sentence is true or false. The second question presupposes the first one. Obviously we must understand a sentence, i.e. we must know its meaning, before we can try to find out whether it is true or not. But from the view of empiricism, there is a still closer connection between the two problems. In a certain sense, there is only one answer to the two questions. If we knew what it would be for a given sentence to be found true then we would know what its meaning is. And if for the two sentences the conditions under which we would have to take them as true are the same, then they have the same meaning. Thus the meaning of a sentence is in a certain sense identical with the way we determine its truth or falsehood; and a sentence has meaning only if such a determination is possible (Carnap (1936b) 200-201).

Within this perspective, Carnap thinks that semantics is important for epistemological analysis. The meaning of a sentence is in a certain sense identical with the way we determine its truth or falsehood; and a sentence has meaning only if such a determination is possible. Accordingly, a profound theory of meaning will also provide us with the ways to determine the truth or falsehood of sentences. There is also an implicit assumption that underlies this thesis; namely, that the unit of empirical verification is a sentence. A sentence is meaningful in so far as it is possible to determine its truth or falsehood by some kind of empirical verification. In previous sections we have argued that as opposed to this view, for Carnap of *Logical Syntax*, confirmation of scientific theories had a holistic structure. In his epistemological analysis in that period, Carnap clearly avoided referring to the meaning of a sentence and its connection with the conditions under which that sentence can be confirmed.

Originally verification theory of meaning had its roots in logical positivists' initial interpretation of L. Wittgenstein's *Tractatus*, especially in M. Schlick's and F. Waismann's works. However, there were objections to this view from some others who were either involved in or had close communication with Vienna Circle e.g. by H. Reichenbach, K. R. Popper, C. I. Lewis and E. Nagel. Taking these objections into account Carnap tried to avoid the problem by presenting a neutral position. However, with his semantical turn, Carnap reveals his sympathy with the connection between confirmation and meaning. Accordingly, in "Testability and Meaning" he tries to modify the so-called verification theory of meaning.

In that paper, Carnap firstly distinguishes two theses as follows: (1) "Every descriptive predicate of the language of science is testable on the basis of observable thing-predicate" (2) "Every descriptive predicate of the language of science is confirmable on the basis of observable thing-predicates" (Carnap (1936b) 234).

Carnap calls the first as the strict formulation and the second as the weaker. He prefers the second because he thinks that scientists are justified to use and actually do use terms, which are confirmable without being testable. Carnap writes that "The introduction [of new terms] was supposed to be made by definition; we know today that we must employ reduction as well" (Carnap (1936b) 234-235).

Carnap calls this revised thesis as *the principle of empiricism* and suggests that it should be seen as a proposal or a requirement rather than an assertion. His basic two modifications are: (a) "confirmation" should replace "verification" since empirical sentences can not be verified absolutely and (b) "confirmability" must be distinguished from "testability". The former modification aims to avoid the earlier oversimplification of the problem of induction, which was the basis of Popper's objections. The latter modification tries to overcome the problem of distinguishing meaningful theoretical sentences from those of pseudo-sentences. When the theory of meaning is based on strict verifiability, not only the pseudo-sentences are regarded as cognitively meaningless, but also some basic empirical principles which cannot be tested directly by experience also turn to be meaningless. It is clear that Carnap is aware of the difficulties:

But from our present point of view, this formulation, although acceptable as a first approximation, is not quite correct. By its oversimplification, it led to a too narrow restriction of scientific language, excluding not only metaphysical sentences but also certain scientific sentences having factual meaning. Our present task could therefore be formulated as that of a modification of the requirement of verifiability. It is a question of a modification, not of an entire rejection of that requirement (Carnap (1936b) 201-202).

Nevertheless he thinks that by the method of *reduction* one can show how a sentence of a scientific language gains empirical meaning and also how it is confirmed by experience derivatively. This is why semantics is important for Carnap. He believes that a scientific method of reduction can be provided by semantic means.

In the named article Carnap does not yet offer definite solutions to these problems. He emphasizes the significance of theory of meaning as it occurs in the methodological and epistemological studies and makes an introduction to the possible methods of reduction. Carnap's target is to develop a scientific theory of meaning, which, together with syntax, will explicate the connection among the sentences of science. Hence Carnap believes that semantics would provide the means to develop an explicit method of reduction by which the sentences of science which cannot be directly tested by observation can be connected to some other primitive sentences which can directly be tested by observation. In this way, Carnap believes, all the sentences of empirical sciences can be shown to be confirmable by experience either directly or derivatively.

4.b Expectations from Semantics

In Introduction to Semantics Carnap explains that a semantic system is a system of rules formulated, in a meta-language that talks about an object language, in a such way that these rules determine a truth-condition for every sentence of the object language:

By a semantical system (or interpreted system) we understand a system of rules, formulated in a metalanguage and referring to an object language, of such a kind that the rules determine a truth-condition for every sentence of the object language, i.e. sufficient and necessary condition for its truth. In this way the sentences are interpreted by the rules, i.e. made understandable, because to understand a sentence, to know what is asserted by it, is the same as to know under what conditions it would be true (Carnap (1942) 22).

Carnap's semantic conception of truth depends on Tarski's work.⁹ However, There is another point where Carnap differs from Tarski. Carnap believes that it is possible to draw a distinction between *logical and factual truth*¹⁰ within semantics that will also illuminate the different ways of truth ascription to the sentences of object language.¹¹ In the preface to *Introduction to Semantics*, Carnap mentions this divergence:

⁹ See Carnap (1936a).

¹⁰ After semantical turn, Carnap replaces his terminology of 'analytic vs synthetic' with that of 'logical vs. factual'.

¹¹ Tarski informs us that semantic conception of truth is neutral toward the questions of eistemology "we may accept the semantic conception of truth without giving up any epistemological attitude we may have had; we may remain naïve realists, critical realists or idealists, empiricists or metaphysicians – whatever we were before. The semantic conception is completely neutral toward all these issues" (Tarski (1931) 71).

Within semantics, I stress the distinction between factual truth, dependent upon the contingency of facts, and logical truth, independent of facts and dependent merely on meaning as determined by semantical rules. I think this distinction is indispensable for the logical analysis of science... Here again, Tarski seems to doubt whether there is an objective difference or whether the choice of a boundary line is not more or less arbitrary (Carnap (1942) xi).

It is, then, not hard to guess what had excited Carnap about semantics with respect to his conception of analytic/synthetic distinction. In section 1.d referring to Tarski's paper on the concept of logical consequence we have explained how the analytic/synthetic distinction depends at root on a distinction hitherto drawn between logical and extra-logical terms. In the preface of Introduction to Semantics, Carnap himself makes the same point when he says that logical/factual and syntax/semantics distinctions "seem, incidentally, to go back to a common root, namely to the distinction between logical and descriptive signs" (Carnap (1942) xi). In the previous section we have concluded that in LSL Carnap had difficulty to draw the distinction between logical and descriptive terms properly within syntax. Carnap's enthusiasm about semantics depends on his assumption that a proper theory of meaning would provide the means to explicate the distinction between logical and descriptive terms. Carnap probably thinks that if he could provide a semantic criterion of the distinction between logical and descriptive expressions, this would also explicate the distinction between analytic and synthetic sentences in a proper manner.

In *Introduction to Semantics* Carnap questions whether it would be possible to define logical/descriptive terms on the basis of semantic concepts and admits that he does not *yet* know such a definition:

Here it is the question whether and how 'logical' and 'descriptive' can be defined on the basis of other semantical terms, e.g. 'designation' and 'true', so that the application of the general definition to any particular system will lead to a result which is in accordance with the intended distinction. A satisfactory solution is not yet known (Carnap (1942) 59).

Carnap agrees with Tarski that there is not yet an objective semantic criterion between logical and descriptive terms. Nevertheless, as opposed to Tarski, Carnap is more optimistic that these notions could be defined by further semantic analysis.

Furthermore, Carnap believes that a proper semantic distinction between logical and factual sentences based on a distinction between the logical and the descriptive expressions of a language would also illuminate the different ways of truth ascription to the sentences of object language, in other words, the so-called epistemic distinction between *a priori and a posteriori*. If he could provide a semantic criterion of what makes a sentence logical, then all those and only those sentences that are determined to be logical would be true by virtue of language. Finally the rest of the sentences which are specified to be factual (depending on the descriptive expressions occurring in them) would be the ones that are true by virtue of empirical facts. Therefore the logical/factual distinction, in Carnap's terms, replaces the so-called distinction between the *analytic a priori* and the *synthetic a posteriori*. However Carnap also needs a further restriction to eliminate the possibility of *synthetic a priori*.

this thesis, all and only those sentences, which can be confirmable by experience directly or derivatively, are empirically meaningful. Accordingly pseudo-sentences for Carnap are the ones which cannot have any truth-value, in other words, pseudosentences are the ones which cannot be connected to testable sentences by method of reduction. In addition, Carnap believes that semantic studies will provide the means for a scientific method of reduction that connects theoretical sentences to primitive ones that are directly testable by experience.

After his semantical turn Carnap seeks to explicate a semantic conception of the logical/factual distinction among the sentences of a language, which will capture the epistemic distinction. Such an explication, according to Carnap, will reveal the difference in one's reasons for the warrant of truth ascription to these sentences, as he mentions:

An L-term (e.g. 'L-true') is to apply whenever the corresponding radical term (e.g. 'true') applies on the basis of merely logical reasons, in contradistinction to factual reasons (Carnap (1942) 60).

If a sentence is neither L-true nor L-false, then we cannot determine its truth-value by the help of the semantical rules alone but we need some knowledge of relevant facts. Therefore, the sentences of this kind are called factual ('synthetic', in traditional terminology) (Carnap (1942) 140).

Carnap does not yet know a proper semantic definition of logical and descriptive terms; so, the distinction between logical and factual sentences is not yet defined on the basis of semantic notions but given as an epistemic proposal. Logical truths are the ones that are true on the basis of logical reasons. If a sentence is neither L-true nor L-false then it is factual. We determine the truth-value of factual sentences on the basis of empirical evidence. In a way Carnap believes that the double distinctions, analytic/synthetic and a priori/a posteriori, are co-extensive, which, he assumes, further semantic studies will make it clear. In the following section we will examine whether Carnap can provide us with the semantic criterion of logical and factual distinction within his mature work on semantics, namely, *Meaning and Necessity*.

4.c Meaning and Confirmation

Carnap begins his semantic analysis in *Meaning and Necessity* with a distinction between object language (the language under investigation) and meta-language (the language used to talk about the object language). For the object languages, he takes "mostly symbolic languages", and "occasionally also the English word language" (Carnap (1947) 3). In order to speak about any object language (the symbolic language systems S_I , etc.), Carnap uses a metalanguage, M, which "is a suitable part of the English language that contains translations of the sentences and other expressions of our object language, names of those expressions, and special semantic terms" (Carnap (1947) 4).

It is important to note that what Carnap calls a *semantic system* is not a metalanguage any more as it were in *Introduction to Semantics*, but rather it is a system of an object language. One interpretation that can dissolve the controversy is that Carnap regards semantics as theory of meaning that can be formulated in a metalanguage. Yet he considers that any object language under investigation has its own semantic system, whose rules can only be formulated in a meta-language.

Another difference, which is more significant, is the following: "The present method for defining the L-terms (For example, 'L-true', meaning 'logically true', 'analytic')

differs from the methods discussed in his earlier book, *Introduction to Semantics*" (Carnap (1947) iii). Such a notification gives us the impression that Carnap himself was actually uncomfortable with the previous definitions since they were based on epistemic concerns rather than semantic ones.

Accordingly, Carnap introduces a new concept; 'L-truth', for what philosophers call logical or necessary or analytic truth and 'F-truth' for what is known as factual or synthetic or contingent truth.

By the explication of a familiar but vague concept we mean its replacement by a new exact concept; the former is called <u>explicandum</u>, the latter <u>explicatum</u>. The concept of L-truth is here defined as an explicatum for what philosophers call logical or necessary or analytic truth. The definition leads to the result that a sentence in a semantical system is L-true if and only if the semantical rules of the system suffice for establishing its truth... The latter concept is an explicatum for what Kant called synthetic judgments. A sentence is F-true if it is true but not L-true; F-truth is an explicatum for what is known as factual or synthetic or contingent truth (Carnap (1947) 7).

Before we continue with his new conception of analyticity, let us first follow some of his definitions and explanations of some basic concepts that he uses for his definitions of L-truth and F-truth.

Carnap constructs his definitions of L-truth and F-truth for the semantic system S_I . Among the members of this system are *customary connectives* such as negation, conditional, biconditional, conjunction etc. and *customary universal and existential quantifiers* and *two* kinds of operators: *iota operator* for individual descriptions and *lambda operator* for abstraction expressions. S_I contains *descriptive constants* (that is nonlogical constants) of individual and predicate types.

Apart from these, there are also semantic rules. Semantic rules attribute meanings to the descriptive constants of the object language by translating them into English. Carnap gives some examples to show how rules of designation can be formulated for the symbols of S_I by translation into English:

For some of these constants, which we shall use in examples, we state here their meanings by semantical rules which translate them into English.

1.1 Rules of designation for individual constants

's' is a symbolic translation of 'Water Scott'

'w' - '(the book) Waverley'

1.2 Rules of designation for predicates

'Hx' – 'x is human (a human being)'

'Rax' - 'x is a rational animal'

'Fx' - 'x is (naturally) featherless'

'Bx' - 'x is a biped'

'Axy' - 'x is an author of y' (Carnap (1947) 4).

A sentence consisting of a predicate of degree n followed by n individual constants is called an *atomic sentence*. Carnap gives a *rule of truth* for the simplest atomic sentences:

1.3 <u>Rule of truth</u> for the simplest atomic sentence. An atomic sentence in S_I consists of a predicate followed by an individual constant is true if and only if the individual to which the individual constant refers possesses the property to which the predicate refers (Carnap (1947) 5).

This rule, says Carnap, presupposes rules of designation. Together with rules I-1 and I-2 it yields the following result as an example: "1.4 The sentence 'Bs' is true if and only if Scott is biped" (Carnap (1947) 5).

Carnap states that there are some further rules of truth for connectives, and quantifiers. In this way Carnap assumes that "the rules of truth together constitute a recursive *definition for 'true in* S_I ', because they determine, in combination with the rules of designation, for every sentence in S_I a sufficient and necessary condition of its truth. Thereby they give an interpretation for every sentence" (Carnap (1947) 5). Carnap gives an example that from the rules of designation and those of truth we learn that the sentence 'Bs' says that Scott is a biped.

Carnap's construction of the distinction between logical and factual truth is based on what he calls state-descriptions. "A *state-description* in semantic system S_I is a class of sentences in S_I , which contains for every atomic sentence either this sentence or its negation, but not both, and no other sentences". And the class of all those state-descriptions in which a given sentence S_I holds is called the *range* of S_I . Accordingly, "All the rules together determine the range of any sentence in S_I ; therefore, they are called *rules of ranges*" (Carnap (1947) 10-11). Besides "by determining the ranges, they give, together with the rules of designation for the predicates and the individual constants, an interpretation for all sentences in S_I , since to know the meaning of a sentence is to know in which of the possible cases it would be true and in which not" (Carnap (1947) 9-10).

For Carnap, in a semantic system there are two different kinds of sentences: Ldeterminate and L-indeterminate (factual) sentences. L-determinate sentences are also divided into two: L-truth and L-falsity. A sentence is L-true if and only if it

holds under all state-descriptions. A sentence is L-false if and only if it does not hold in any state-description. A sentence is L-indeterminate (factual) if and only if there is at least one state-description in which it holds and at least one in which it does not hold (Carnap (1947) 11-12).

For L-determinate sentences, semantic rules not only determine the truth conditions of these sentences but also their truth. For an L-true sentence, Carnap's reasoning is as follows: If S_i holds in every state-description, then the semantical rules of ranges suffice for establishing this result. "Therefore, the semantical rules establish also the truth of S_i , because if S_i holds in every state description then it holds also in the true state-description and hence is itself true" (Carnap (1947) 11). A similar reasoning can easily be extended to L-false sentences.

For L-indeterminate (factual) sentences, semantic rules only establish the sufficient and necessary conditions, but do not suffice to establish their truth or falsity. According to Carnap their truth depends on the facts of the world. Moreover, Carnap maintains that their truth-values can be determined by experience. Let us see the details of his definitions for further analysis.

Logical Truth (L-True)

2.1 Convention. A sentence S_i is <u>L-true</u> in a semantical system S if and only if S_i is true in S in such a way that its truth can be established on the basis of the semantical rules of the system S alone, without any reference to (extra-linguistic) facts.

This is not yet a definition of L truth. It is an informal formulation of a condition, which any proposed definition of L-truth must fulfill in order to be adequate as an explication for our explicandum.

2-2 Definition. A sentence S_i is <u>L-true</u> (in S_I) = $_{Df} S_i$ holds in every statedescriptions (in S_I)

... If S_i holds in every state-descriptions, then the semantical rules of ranges suffice for establishing this result... Therefore, the semantical rules establish also the truth of S_i because, if S_i holds in every state description, then it holds also in the true state-description and hence is itself true (Carnap (1947) 10-11).

For Carnap, L-truth is an explicatum for the explicandum, which is known as logical truth (or necessary or analytic truth) in the philosophical tradition. Accordingly, he gives the convention above as a condition that a definition should fulfill in order to be adequate as an explication for the explicandum. His convention also states that "S_i is L-true if and only if its truth can be established without any reference to (extralinguistic) facts". In his explanations, Carnap clarifies that by extra linguistic facts he means the facts of the world. Therefore his convention is meant to be: *A sentence S_i* is L-true in a semantical system S if and only if S_i is true in S such a way that its truth can be established on the basis of the semantical rules of the system S alone, without any reference to the facts of the world. Carnap gives the convention as a condition that a definition should fulfill in order to be adequate as an explication for the explicandum. Depending on his own convention, Carnap's intention is to give a definition of Logical Truth which will provide us with an explication of what Kant calls analytic a priori. In other words, his explication will also illuminate the reason
for truth ascription to logical sentences i.e. their truth would be established on the basis of semantical rules without reference to the facts.

Factual Truth (F-True)

2-7. Definition. S_i is <u>L-indeterminate</u> or <u>factual</u> (in S_I) = _{Df} S_i is not L-determinate.

2-8 A sentence is factual if and only if there is at least one state-description in which it holds and at least one in which it does not hold.

The concept of F-truth to be defined by 2-9a is meant as an explicatum for what is usually called factual or synthetic or contingent truth in contradistinction to logical or necessary truth...

2-9. Definitions

- a. S_i is <u>F-true</u> (in S_I) = $_{Df} S_i$ is true but not L-true.
- b. S_i is <u>F-false</u> (in S_i) = $_{Df}$ S_i is F-true. (Carnap (1947) 12).

There is something peculiar about Carnap's conception of factual truth. Let us first pay attention to his conception of truth in general.

For the purposes of our discussion it is not necessary to give the whole definition of truth. It will suffice to presuppose that the term 'true' is defined in such a manner that it has its customary meaning as applied to sentences. More specifically, we presuppose that a statement in M saying that a certain sentence in S_I is true means the same as the translation of this sentence; for example, 'the sentence 'Hs' is true in S_I ' means the same as 'Walter Scott is human' (Carnap (1947) 5-6).

I will try to explain what is troublesome in that part of the quotation which is bold written. According to Carnap, 'Hs' is a sentence of a semantic system, S_I. More

specifically the sentence 'Hs' is a factual sentence in S_L , which means 'Walter Scott is human'. Carnap defines *factual sentence* as follows: A sentence is factual if and only if there is at least one state-description in which it holds and at least one in which it does not hold. A state-description in S_I is a class of sentences in S_L , which contains for every atomic sentence either this sentence or its negation, but not both, and no other sentences. Hence there would be at least one state-description in S_I in which the sentence 'Hs' (i.e. 'Walter Scott is human') holds and at least one in which it does not hold. Therefore expressing a sentence 'Hs' (i.e. 'Walter Scott is human') in an object language S_I does not necessarily mean that ''Walter Scott is human' is true in S_I '. Otherwise, one is committed to express only true sentences in object language S_I . Carnap explains the relation between the concept of state-description and that of truth as follows:

There is one and only one state-description which describes the actual state of the universe; it is that which contains all true atomic sentences and the negations of those which are false. Hence it contains only true sentences; therefore we call it the true-state-description. A sentence of any form is called true if and only if it holds in the true state-description (Carnap (1947) 10).

If 'Walter Scott is human' really means the same as 'the sentence 'Hs' is true in S_I ' then S_I must be composed of only sentences of true state-description.

Accordingly, if one wants to talk about the truth of a factual sentence of a semantic system then one shall first specify the true state-description in which that sentence holds. Next comes the difficult question: how is this specification to be made? One answer may be that one must appeal to experience to see whether that state-description corresponds with the actual state-description of the world. Another option

is to assume that our semantic system would only consist of sentences that belong to *true state-description* that corresponds to the facts of the universe. Carnap explicitly says that there are classes of sentences in S_I , which give a possible state of the universe other than the actual one. If the sentence 'Hs' ('Walter Scott is human') belongs to one of those possible state-descriptions of the universe but not to the actual one, then 'Walter Scott is human' does not necessarily mean the same as 'the sentence 'Hs' is true in S_I '. The correct formulation should be as follows: 'the sentence 'Hs' is true in S_I ' means the same as ''Walter Scott is human' holds in the true state-description of S_I '.

Within his further explanations, Carnap actually gives us a specification of true statedescription in the same way that classical correspondence theory of truth does: "*Rule of truth* for the simplest atomic sentence: An atomic sentence in S_I consists of a predicate followed by an individual constant is true if and only if the individual to which the individual constant refers possesses the property to which the predicate refers" (Carnap (1947) 5). He also informs us that truth-values of factual sentences can be established by appeal to observation of facts.

1-4 The sentence 'Bs' is true if and only if Scott is a biped (Carnap (1947) 5).

...As an example of F-truth, consider the sentence 'Bs'. We found earlier with the help of a rule of designation, that 'Bs' is true if and only if Scott is a biped (I-4). This result does not tell us whether 'Bs' is true or not; it merely states a sufficient and necessary condition for the truth of the sentence 'Bs'. This is all we can learn about 'Bs' from the semantical rules alone. If we want to determine the truth-value of 'Bs', we have to go beyond the mere semantical analysis to the observation of facts. We see from I-4 which facts are relevant: we must look at the thing Walter

Scott and see whether it is a biped. Observation shows that this is the case. Therefore, 'Bs' is true. Since the semantical rules do not suffice for establishing its truth, it is not L-truth; hence it is F-true (Carnap (1947) 12).

Carnap acknowledges that I-4, alone, does not tell us whether 'Bs' is true or not. Carnap then informs us that we should appeal to observation to see whether this sentence is true or not. If our observation shows that this is the case, then we can claim that 'Bs' is true.

The semantic conception of truth, as we have learned from Tarski, does not tell us how we determine the truth of an atomic sentence. In fact, the semantic definition of truth implies nothing regarding the conditions under which an atomic sentence like 'Scott is a biped' can be asserted. It implies only that whenever one asserts or rejects this sentence in the object language s/he must be ready to assert or reject the correlated sentence in the meta-language "the sentence 'Bs' is true". In addition, Tarski draws attention to the central problem of truth: "the construction of the definition of true sentence and establishing the scientific foundations of the theory of truth belongs to the theory of knowledge" (Tarski (1930) 267). He also emphasizes that his semantic work deviates from the main stream of such investigations.

The main difference between Tarski's semantical analysis and Carnap's is the difference in their conception of semantics. For Carnap a semantical analysis (as an analysis formulated in meta-language) must also provide the semantic rules of object language (the rules of designation) which gives meaning to the terms used in object language. As opposed to this view, the sentences of the object language that Tarski refers are already meaningful. He does not propose to give a theory of meaning for them. He just refers to the meaningful sentences of the object language. The

expressions of the language system under investigation are meaningful and Tarski translates them into meta-language by assigning variables which represent the names of the objects of that language.

Carnap's object language, S_I, contains *descriptive constants* of individual and predicate type, which are devoid of any meaning until they are interpreted by the semantic rules given in meta-language. By the semantic rules of designation for individual constants and for predicates, Carnap presumes to assign *meanings* to them. For instance the sentence 'Bs' means 'Water Scott is biped' (or expresses the proposition that Water Scott is biped) by virtue of two semantic rules: one for the designation of individual constant: 's' is a symbolic translation of 'Water Scott' and the other is for the predicate: 'Hx' is a symbolic translation of 'x is human (a human being)'.

In this way Carnap assumes that all the rules together determine the range of a sentence in S_I , namely the class of all those state-descriptions in which that sentence holds. Furthermore, Carnap believes that by determining the ranges, they give, together with the rules of designation for the predicates and the individual constants, an interpretation for all sentences in S_I , since he thinks that to know the meaning of a sentence is to know in which of the possible cases it would be true and in which not (Carnap (1947) 9-10).

Accordingly Carnap tries to give a theory of meaning for descriptive sentences by rules of designation, which will clarify the conditions under which that sentence would be true. But the semantic rules he gives simply assigns a meaningful English sentence to the meaningless signs of a symbolic language under investigation. He first gives an interpretation for that sentence in English i.e. the sentence of object language, 'Hs' is translated into 'Walter Scott is human'. Afterwards Carnap provides us with a rule of truth: "An atomic sentence in S_I consists of a predicate followed by an individual constant is true if and only if the individual to which the individual constant refers possesses the property to which the predicate refers" (Carnap (1947) 5). In other words, Carnap reformulates the classical correspondence theory of truth which is an epistemological theory of truth. Tarski's semantic work deviates from the main stream of such investigations. I shall repeat what Tarski says about the central problem of truth; "the construction of the definition of true sentence and establishing the scientific foundations of the theory of truth belongs to the theory of knowledge" (Tarski (1930) 267). This is exactly what Carnap's concern is.

Tarski's semantic conception of truth is only appropriate for formalised languages of sciences. He maintains that "the concept of truth (as well as other semantical concepts) when applied to colloquial language with the normal laws of logic leads inevitably to confusions and contradictions" (Tarski (1930) 267). However, Carnap makes use of English language for construction of his object language by translating the signs of this language into English. He also gives us a rule of truth for the object language that resembles correspondence theory of truth. Hence his conception of truth exceeds the limits of Tarski's semantic conception of truth.

We have ended the previous section with the expectation that Carnap would provide us with a semantic criterion that will determine whether a term is logical or descriptive (non-logical) and subsequently will also determine the difference between analytic (logical) and synthetic (factual) sentences. However he does not explicitly provide us even with the semantic rules of the language he investigates. Especially for the rules of designation of the object language S_I Carnap just gives us

translations into the sentences of English language. It seems that according to Carnap if one knows English language one will at the same time know the meanings of these sentences. Accordingly one will also know which terms are descriptive and which are logical. If one knows how to use English language then one will understand the sentences of English language. It may even be possible to name some terms of English language logical and some others non-logical arbitrarily but more or less in the same lines, each time we construct an artificial language. However, this is what Carnap had already achieved in his period of syntax. The distinction is still not objective. Semantics could not supplement syntax for this purpose as far as it just connects us back to English with mere translation. One wonders why Carnap took the trouble to follow such an indirect way; he could have just informed us that we have a commonsensical distinction of logical and descriptive terms in so far as we have a mastery of ordinary English for the purpose of communication.

Considering the period that begins with his semantical turn, Carnap's intention was to provide the *semantic structures of sentences* that would also illuminate *the ways of truth determination*. Carnap's principle of empiricism maintains that the meaning of a sentence is in a certain sense identical with the way we determine its truth or falsehood; and a sentence has meaning only if such a determination is possible. Thus Carnap thought that a profound theory of meaning would also explicate the different ways of truth determination. However, in so far as Carnap does not provide a semantic criterion of what makes a sentence logical and factual, his distinction between logically true and factually true sentences turns to depend on different reasons of truth ascription to these sentences. On the one hand there are logical truths that are established with reference to the semantic rules. On the other, there are factual truths, which are established by appeal to observation/experience. Carnap does not explicitly provide us with a semantic criterion of what makes a sentence logical or factual but leaves it to be defined relative to a language system. Hence, the difference between logical and factual sentences, *on objective grounds for all language systems*, is the difference in the ways of truth determination.

I think this forms – partly – the basis of Quine's first argument in ""Two Dogmas of Empiricism"". Hence let us first examine Quine's concerns and then turn to some further problems in Carnap's conception of reduction, which is the basis of Quine's second argument in "Two Dogmas".

5. Quine's objections to the Semantic Notion of Analyticity

In my analysis of Quine's objections against the semantic notion of analyticity, I will follow the historical sequence of Quine's two related papers: first I will examine the "Two Dogmas of Empiricism" and next "Carnap and Logical Truth". Both of these analyses will be restricted to clarification of Quine's line of reasoning, avoiding any further comment.

5.a Two Dogmas of Empiricism

The subject matter of Quine's paper is the two dogmas that dominated the first half of the 20th century empiricism. The first dogma, says Quine, is the belief in some fundamental distinction between analytic truths (grounded in language independently of matters of facts) and synthetic truths (grounded in matters of facts). The other dogma, for Quine, is *reductionism*: "the belief that each meaningful statement is equivalent to some logical construct upon terms which refer to immediate experience" (Quine (1951) 20). Quine aims to show why both of the dogmas must be forsaken. He gives an argument against each dogma: his first argument is against the notion of analyticity in the broad sense, and his second argument is against reductionism. These arguments result in the withdrawal of a priori/a posteriori distinction (among statements) as well.¹² Finally in the last section Quine gives an outline of empiricism without dogmas.

¹² This result is more explicit in his later paper "Carnap and Logical Truth", which is the topic of next section.

Part I. Criticism of the Notion of Analyticity

Background of the Notion of Analyticity

Quine first indicates that the description of analyticity as *truth by virtue of meanings* rests on a presupposition of "meanings". Then he questions what sort of things meanings are; mental ideas or Platonic objects? Quine argues that the need for meanings as "intermediary entities" arises from the failure to distinguish meaning from reference. A theory of meaning (meaning as "intermediary entities"), if possible, would provide us with the synonymy relations and derivatively the analyticity of statements. However Quine suggests that we shall rather abandon the thought of meaning if meanings are regarded as distinct entities. As a result of abandoning the thought of "intermediary entities" called meanings, Quine announces that the problem of analyticity confronts us anew. From then on, he directs his analysis to the "analyticity" (Quine (1951) 22-23).

Subsequently, Quine distinguishes two notions of analyticity: *logical truth* (analytic in the narrow sense) and *analytic* (in the broad sense). Considering the former, Quine explains that "a logical truth is a statement which is true and remains true under all reinterpretation of its components other than logical particles" (Quine (1951) 22-23). For the latter, Quine says that the general characterisation of an analytic sentence is that "it can be turned into a logical truth by putting synonyms for synonyms" (Quine (1951) 23). He argues that this is not yet a proper characterisation since it is based on the notion of "synonymy" which itself needs clarification. So, Quine starts his investigation for other possible ways of explaining analyticity (in the broad sense):

Carnap and State-descriptions

Quine's first reference is to Carnap's conception of analyticity based on statedescriptions. Quine asserts that Carnap's criterion in terms of state-descriptions works at best for the specification of logical truth rather than analyticity in the broad sense. According to Quine, Carnap's criterion is insufficient to capture the extralogical synonymy pairs such as 'bachelor' and 'unmarried man' since it rests on a supposition that synonymy pairs in English are understood.

Definition

Quine analyses whether analytic sentences can be reduced to logical truths by *definition*, where definition may be characterized in three different ways:

- Lexicographer's definition: Quine observes that lexicographer is an "empirical scientist", who records the facts he observes about the usage of expressions. Quine says that a lexicographer interprets 'bachelor' as 'unmarried man' since he believes that there is a relation of synonymy between these expressions in usage. In other words, Lexicographer's definition depends on a prior relationship of synonymy, and the notion of synonymy presupposed here still needs to be clarified. In view of this, Quine concludes that Lexicographer's definition is a report of an antecedent usage and cannot be taken as the ground of "synonymy" (Quine (1951) 24-25).
- (2) Carnap's conception of explication: Quine questions a different kind of definition what Carnap calls explication, which does not aim to report a preexisting synonymy relation like lexicographer's definition. In explication, the purpose is to provide refinement in the meaning of an antecedent concept, *definiendum*, by paraphrasing it into *definiens*. Quine argues that even

explication though not merely reporting a pre-existing synonymy between definiendum and definiens, does nevertheless rest on other pre-existing synonymies. Quine explains this with a notion of *contextual synonymy*; that is, "each of these favoured contexts of the definiendum, taken as a whole in its antecedent usage, be synonymous with the corresponding context of the definiens" (Quine (1951) 26-27). So Quine claims that there is still a synonymy relation presupposed between definiendum and definiens; the total of contexts which definiendum appear in its antecedent usage is required to be synonymous with the total of contexts in which definiens are introduced. Finally Quine asserts that this notion of contextual synonymy is in need of clarification as much as the direct synonymy relation between the two expressions is.

(3) Definition in Formal Works: Quine says that another form of definition appears in formal works, i.e. logical and mathematical writings. Quine maintains that in formal systems there might be cases where two foregoing languages can be correlated for pragmatic reasons. This relation between the two languages, says Quine, is the whole-part relation where "whole and part are correlated by the rules of translation" (Quine (1951) 27). In other words, each expression is equated to some combinations of primitive notations. So construed, says Quine, translation rules seem to appear as definitions in formal systems. In such cases, definiens is the paraphrase of the definiendum into a primitive notation, which preserves a direct synonymy. Here again, argues Quine, the definition presupposes a prior relation of synonymy. Quine points out that the extreme sort of formal correlation is "sheer abbreviation", which is a conventional introduction of novel notations as a replacement of the antecedent ones. In this

has been *created* for the purpose of being synonymous with the *definiens*. Quine assures us that this is neither a genuine type of definition nor that of synonymy.

Finally Quine concludes that in each of these three cases, definition still rests on prior synonymy relationships. Therefore he announces that he would focus on the notion of synonymy rather than definition from then on.

Interchangeability

Quine indicates that a possible explanation for the notion of synonymy is *interchangeability salva veritate*; that is, "the synonymy of two linguistic forms consists simply in their interchangeability in all contexts without change of truth-value" (Quine (1951) 27). Quine notes that here what we are concerned with is *cognitive synonymy*. One way to explain cognitive synonymy would be through a direct appeal to analyticity. Another way might be to give an account of cognitive synonymy in terms of necessity and explain the notion of necessity through analyticity. In each alternative the notion of cognitive synonymy which is supposed to explain analyticity presupposes the notion of analyticity. Such a line of reasoning, says Quine, "not flatly circular but something like a closed curve in space" (Quine (1951) 30).

Therefore Quine concludes that *interchangeability salva veritate* is meaningless unless it is relativized to a language whose extent is specified. One way of doing this is to give a formalised language system which is generally adequate to classical mathematics. Quine calls a language system of this form as *extensional language*. He maintains that this would not be the assurance of synonymy of the desired type, cognitive synonymy, which underlies analyticity (in the broad sense).

Semantical Rules

According to Quine the major problem of the concept of analyticity is to give the general criterion that specifies a sentence to be analytic for a language system. Quine notes that this problem is generally attributed to ordinary languages but not to precise artificial languages with explicit "semantic rules". Quine argues that the problem of general criterion exists for artificial languages as well as natural languages. Accordingly, he appeals to Carnap's understanding of semantic rules in order to support his point. He gives two forms of semantic rules and the following reasons to show the implausibility of each form to explicate the notion of analyticity:

- (1) Semantic rules may have the form explicitly of a specification, by recursion or otherwise, of analytic statements of an artificial language, i.e., L_o. Quine argues that we do not know the sense of the general relative term 'analytic for'. These rules tell us that some statements are analytic for a given language system, L_o, but they do not give us the *intended specification* that marks those sentences as analytic. By saying what statements are analytic for L_o we give a criterion for 'analytic for L_o' but not 'analytic for' L where L applies to any language system (Quine (1951) 33).
- (2) Semantic rule may have the form that specifies such and such statements are included among the truths. Accordingly a statement is called analytic if it is true according to the semantical rules. But, says Quine, "not every statement which says that the statements of some class are true can count as a semantic rule otherwise all truths would be analytic in the sense of being true according to semantic rules" (Quine (1951) 34). In other words, there is no real progress as far as we appeal to another unexplained word 'semantic rule' instead of analytic.

Quine finally argues that without any criterion of specification given, sematic rules can only be distinguished as a label, namely, 'Semantic Rules'.

Quine concludes that a strategy, which takes analyticity merely as a primitive notion, can not explicate the notion of analyticity itself.

Part II. Criticism of the Thesis that the Unit of Confirmation is Individual Statement Verification Theory and Reductionism

Quine explains that the verification theory of meaning is thesis that "the meaning of a statement is the method of empirically confirming or infirming it" (Quine (1951) 37). Quine says that once this theory is accepted, an account for the synonymy of statements (not of linguistic expressions) can be given in the following way: "two statements are synonymous if and only if they are alike in their methods of confirmation or infirmation" (Quine (1951) 37).

With respect to the question about these methods and the nature of the relationship between a statement and the experiences which contribute to detract from its confirmation, Quine says that an answer comes from the view called *reductionism*. Quine reminds us that in The *Aufbau*, Carnap's project was based on a *radical form of reductionism*. The purpose was to show that every meaningful statement could be translated into a statement (true or false) about immediate experience. This view, says Quine, had been abandoned long ago even by Carnap himself in his later writings. However, there is yet a moderate form of reductionism which still has an influence on empiricism. Quine summarises the idea behind the *moderate reductionism* as follows: "to each statement, or each synthetic statement, there is associated a unique range of possible sensory events such that the occurrence of any of them would add to the likelihood of truth of the statement, and that there is associated also another unique range of possible sensory events whose occurrence would detract from that likelihood." (Quine (1951) 38). Quine argues that verification theory of meaning supported by reductionism, even in this moderate form, still carries an implicit assumption that each statement, *taken in isolation*, can be confirmed or infirmed by experience. In other words, the assumption is that the unit of confirmation is individual statement.

Quine establishes the connection between the verification theory of meaning (supported with reductionism) and the notion of analyticity in two ways: A statement is described as analytic (1) if it is "synonymous with a logically true statement" (Quine (1951) 38), (2) if it is "viciously confirmed, ipso facto, come what may" (Quine (1951) 41). The basis of this connection is that verification theory of meaning gives us a definition of logically true statement based on the method of confirmation. More explicitly, according to this theory, a logically true statement is a statement that is confirmed under any kind of experience. As long as the unit of confirmation is taken as an individual statement, says Quine, those and only those statements, which are confirmed no matter what, can be called logically true. Moreover, according to the thesis of reductionism a statement is analytic if it is synonymous with a logically true one and it is possible to show that by reducing them to the same range of possible sensory events. In this way, Quine argues that the two dogmas; the distinction between the analytic and the synthetic, and reductionism, are "at root identical" as long as they are both based on the idea that unit of confirmation with experience is an individual statement.

Empiricism without dogmas

Quine's counter-suggestion is that the unit of empirical significance is the whole of science rather than individual statements. The total of science, says Quine, resembles "a field of force whose boundary conditions are experience" (Quine (1951) 39). A particular experience cannot be considered to show directly which statement to be revised in this field. The total of science is so "underdetermined by experience" that there are a variety of choices for which statements to be revised. The decision is guided by the considerations of equilibrium and simplicity, which actually affects the whole system. As a result, Quine asserts that it is not adequate to "speak of a linguistic component and a factual component in the truth of any individual statement. Taken collectively, science has its double dependence upon language and experience; but this duality is not significantly traceable into the statements of science taken one by one." (Quine (1951) 39). More specifically, Quine argues that although science as a whole depends on language and experience, the distinction between the analytic and the synthetic, construed as the difference in the methods of confirmation of individual statements; grounded in language versus grounded in facts, is ill grounded.

5.b Carnap and Logical Truth

At the beginning of "Carnap and Logical Truth", Quine indicates that one of the basic attentions of the "movement which began with Wittgenstein's *Tractatus* and reached its maturity in the work of Carnap" was forced upon the question, "How is logical certainty possible?" (Quine (1954) 107). In general, Quine calls the early logical positivists' solution to this problem as *the linguistic doctrine of logical truth*. Accordingly, in sections between I and VI Quine analyses this doctrine and starting from section VI to the last section, X, he focuses on Carnap's view as a version of this general doctrine. Correspondingly I also divide my analysis into two parts: the first part is about Quine's analysis of linguistic doctrine of logical truth.

Part I Linguistic Doctrine of Logical Truth

Quine starts with giving a general conception of logical truth without thought of any epistemological corollary. He says that without thought of any epistemological significance, either the linguistic doctrine or another may mark out the intended scope of the term 'logical truth' in the following way: "First we suppose indicated, by enumeration if not otherwise, what words are to be called logical words; typical ones are 'or', 'not', 'if', 'then', 'all', 'every', 'only', 'some'. The logical truths, then, are those true sentences which involve only logical words essentially" (Quine (1954) 110). However, Quine indicates that this does not itself imply that logical truths *owe their truth to language*. According to Quine, we have only achieved a classification of sentences "*per accidents*". He informs us that the *linguistic doctrine* claims to have an epistemological corollary:

Afterward the linguistic doctrine of logical truth, which is an epistemological doctrine, goes on to say that logical truths are true by virtue purely of the intended meanings, or intended usage, of the logical words (Quine (1954) 110).

In sum, what troubles Quine is not the specification of some sentences as logical truths but rather a further claim that these sentences owe their truth to language. Accordingly, Quine's objection is against the epistemological footing of this doctrine. Let us now focus on his arguments.

Quine first classifies the possible scope of *linguistic doctrine* into two: (1) *elementary logic* which comprises "truth-function theory, quantification theory, and identity theory" and (2) *set theory*, which "requires classes among the values of its variables of quantification" (Quine (1954) 110). Correspondingly, Quine analyses the credibility of the linguistic theory of logical truth applied to these two notions of logic respectively.

(1) In case that the linguistic theory of logical truth is applied to elementary logic the problem, for Quine, is that the theory seems to imply nothing beyond the saying that elementary logic is obvious. Quine notes that he uses the vaguely psychological word "obvious" *non-technically*, assigning it no explanatory value. Quine indicates that the use of such a vague concept is not a problem for his own purposes mainly because he does not aim to propose an alternative solution; rather, aims to show that the linguistic doctrine does not bring any further epistemic explanation either. He himself puts this as follows: "My suggestion is merely that the linguistic doctrine of elementary logical truth likewise leaves explanation unbegun. I do not suggest that the linguistic doctrine is false and some doctrine of ultimate and inexplicable insight

into the obvious traits of reality is true, but only that there is no real difference between these two pseudo-doctrines" (Quine (1954) 112).

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The linguistic theory of truth, says Quine, is "sometimes expressed by saying that such truths are *true by linguistic convention*" (Quine (1954) 115). In that case, there is the difficulty of vicious regress for it is impossible in principle "to get even the most elementary part of logic exclusively by the explicit application of conventions stated in advance" (Quine (1954) 115).¹³

In sum, Quine asserts that for elementary logic, the linguistic doctrine does not have any explanatory power more than any other pseudo doctrine. Beyond that if "convention" is used for explanation then the doctrine is, in principle, mistaken.

(2) In case that linguistic theory of logical truth is applied to *set theory*, Quine thinks that the doctrine may have some credit since "convention" seems to make sense for set theory.

Quine divides postulation in set theory into two: *legislative* and *discursive postulation*. According to Quine, legislative postulation is what hints the real sense of *truth by convention*. The latter, discursive truth, does not fix truth, it is "mere selection from a pre-existing body of truths" (initially known or unknown). Both kind of postulation, says Quine, is conventional but only legislative postulation is a proper indication of *truth* by convention (Quine (1954) 118).

Quine makes a similar distinction for *definition* in the same line with that of postulation; that is, definition is also divided into two: legislative and discursive.

¹³ For the details of his argument Quine gives reference to "Truth by Convention" Quine (1935), which is explained in section 3.a of this thesis.

Both for postulations and definitions Quine notes that it is <u>only</u> legislative definition (or postulation), and not discursive definition (or postulation) that makes a contribution to the truth of sentences.

Quine observes that the "conventionality" refers to *the act*, and not to *the enduring consequence*. In a word, Quine says that conventionality is a characteristic of events and not of sentences. So conceived, he argues that "conventionality is a passing trait, significant at the moving front of science but useless in classifying the sentences behind the lines" (Quine (1954) 119). Considering set theory Quine concludes that *truth by convention* makes sense, but only for a process of adoption, i.e. "legislative postulation", but not for the "legislatively postulated sentence". In this way Quine tries to clarify that the postulation of truths conventionally does not imply that postulates themselves are true by virtue of linguistic convention.

Subsequently Quine questions whether we find the same conventional character in the theoretical hypothesis of natural science itself. He observes that this can be attributed to the hypothesis of natural science as well. But for these hypothesis there is some eventual confrontation with empirical data, which is indirect but still may save the situation from the characterisation of truth by convention. A self-contained theory which we can check with experience also includes logic and mathematics so Quine argues that some such "remote confrontation" with experience may be claimed even for mathematics and elementary logic. Quine thinks that the theory is confirmed as a whole by remote empirical data. Empirical confrontation does not apply to individual sentences but to the system as a whole. This view actually forms the basis of his epistemic holism.

Finally Quine argues that he can not see how a line is to be drawn between hypothesis which confer *truth by convention* and hypothesis which confer *truth by empirical data*:

We had been trying to make sense of the role of convention in a priori knowledge. Now the very distinction between a priori and empirical begins to waver and dissolve, at least as a distinction between sentences. (It could of course still hold as a distinction between factors in one's adoption of a sentence, both factors might be operative everywhere) (Quine (1954) 122).

As a summary, Quine argues that on the one hand, postulates (legislative ones) can be adopted conventionally in natural sciences likewise in mathematics, and on the other hand, remote confrontation with experience (as a method of justification) applies to mathematics in the same manner as it applies to the theoretical parts of natural sciences. Besides Quine indicates that truth by convention is sensible only as an act in adoption of a sentence, but it is not a trait of sentences themselves. Thus, Quine concludes that the epistemic distinction between sentences (i.e. the a priori/ empirical distinction) dissolves. There might yet be a distinction in adoption of a sentence but this does not institute the distinction in the ways of justification.

Part II. Carnap's Conception of Logical Truth

After this general introduction, Quine focuses on Carnap's conception of logical truth. Considering *Logical Syntax*, he first summarizes Carnap's thesis for logical truth as follows: "This theory characterises logic (and mathematics) as the largest part of science within the true-false dichotomy can be reproduced in syntactical

terms" (Quine (1954) 124).¹⁴ Quine says that formulated in this way the thesis does not imply that logic and mathematics are true by linguistic convention. For this reason it is more intelligible and if adequate, it is even important. Quine next examines Carnap's thesis in Logical Syntax to comment on its adequacy. Quine explains that for Language I, Carnap's formulation of logical truth is "narrowly syntactical", which depends on axioms and inference rules of logic; "familiar formalisations of logical systems". Quine indicates that due to Gödel's proof of the incompletability of elementary number theory, this approach can not be applied to mathematics in general. Quine maintains that in consequence, for language II, which includes mathematical vocabulary, Carnap follows a different way for formulation of logical truth. This new approach says Quine, is technically similar to Tarski's conception of truth. Quine argues that construed in this way, the thesis that logicomathematical truth is syntactically specifiable becomes uninteresting. This thesis would hold equally well if 'logico-mathematical' were broadened to include physics, economics, etc. In sum, Quine argues that although Carnap is not technically wrong, his thesis is uninteresting since "no special trait of logic and mathematics has been singled out after all" (Quine (1954) 125). Quine argues that the specification is made due to the fact that Carnap already presupposes logico-mathematical vocabulary at hand for his definition.

For what it says is that logico-mathematical truth is specifiable in a notation consisting solely of (a) [names of signs], (b) [an operator expressing concatenation of expressions], and the whole logico-mathematical vocabulary itself (Quine (1954) 125).

¹⁴ I shall remark that Quine's interpretation of Carnap's conception of convention in LSL is parallel to our analysis made in section 2. Since Quine also writes that Carnap's proposal is weaker than the

In this way, Quine clarifies that *the doctrine of syntactical specifiability of logical truth* (the view he attributes to early Carnap) has always been different from the *linguistic doctrine of logical truth* (the view that he attributes to early Logical Positivists). The former just says that logical truth is <u>specifiable</u> in syntactical terms, the latter also claims that it is grounded in language, hence only the latter carries an epistemological import. Quine underlies the fact that in *Logical Syntax*, Carnap intends to propose a doctrine of syntactical specifiability of logical truth. In this way, he also accepts that Carnap in the period of syntax was not after an *epistemological notion of analyticity*, which we have argued in section 2. However, Quine argues that although Carnap is not technically wrong he makes the specification with a supposition of mathematical vocabulary already at hand. In other words, it is as if Carnap restricts Tarski's definition of truth to the language of mathematics and replaces the terminology of "truth" with "analytic".

Then Quine focuses on Carnap's later semantical period. He draws attention to a difference in Carnap's position in this period. He writes: "the semantical attribute of logical truth, in particular, *is* one which, according to Carnap, is grounded in language: in convention, fiat, meaning" (Quine (1954) 126). Here Quine underlines the fact that Carnap changes his thesis for logical truth from *the doctrine of syntactical specifiability of logical truth* to *the semantic doctrine of logical truth* where the latter is an epistemological doctrine. Quine points that it is Carnap's latter position that is ill-grounded. He argues that the problem of linguistic doctrine of logical truth (i.e. the thesis that logical truths are true by linguistic convention") extends to Carnap's semantic notion of analyticity:

claim that logic and mathematics are true by convention.

What has made it so difficult for us to make satisfactory sense of the linguistic doctrine is the obscurity of 'true by language'. Now 'synonymous' lies within the same central obscurity; for, about the best we can say of synonymous predicates is that they are somehow "co-extensive by language". The obscurity extends, of course, to 'analytic' (Quine (1954) 129).

In this way, Quine asserts that the problem for the notion of logical truth applies to the notion of analyticity as well. He then points out that the problem of alayticity is even greater than that of logical truth because of the obscurity of "synonymous". Quine clarifies that logical truths include only logical words essentially, but analytic sentences are broader in scope since they also include "synonymies". Although the epistemological corollary of linguistic doctrine of logical truth is mistaken. Ouine says that there is still a tolerable situation for the specification of logical truth, which depends on the characterisation of logical vocabulary. Quine believes that such a specification is possible as long as we restrict ourselves to the logical vocabulary given in modern logic (i.e. 'or', 'not', 'and' etc.). In case of analyticity, he argues that not only the epistemological merit but the possibility of the specification itself is in question. Quine indicates that we can have an understanding of logical vocabulary (in a relatively narrow sense) but not of synonymous pairs. To specify analytic truths, says Quine, we need an account of "synonymies" throughout a universal language. Finally he asserts that Carnap does not give such an account of synonymy and as long as he can not, his semantic conception of analyticity is not merely devoid of epistemic significance but also inadequate.

To sum up, according to Quine, the linguistic doctrine of logical truth has two posits: (1) logical truths can be specified linguistically (2) logical truths are grounded in

language - are true by virtue of linguistic convention. Quine argues that the latter, which attaches an epistemic significance to the doctrine, is clearly mistaken. The conventional act of postulation does not imply that the postulates are true by virtue of convention. For the former, Quine says that the thesis is tolerable if the characterization of logical vocabulary is restricted to the vocabulary of modern logic. Carnap, in LSL, attempts to give a specification of analytic truth. Carnap restricts the area of his investigation with L-languages in which vocabulary of mathematics is already taken to be specified. Quine argues that Carnap's technique can be applied to a broader region including other disciplines as well and hence no special trait of mathematical truths is achieved in Carnapian way. Finally Quine analyses Carnap's latest thesis, the semantic conception of analyticity. He argues that this thesis is mistaken for two reasons: (1) The thesis implies that analytic truths are true by virtue of lanaguage, which is mistaken in the same way with the second posit of the linguistic doctrine. (2) There is not even a tolerable situation for the specification of analytic truths (in the broad sense) because there is not an understandable account of synonymy.

6. Final Evaluation of the Significance of Analyticity

In this section, I will analyse Quine's objections against Carnap's conception of analyticity. Since there is a difference in Carnap's conception of analyticity between his period of syntax and that of semantics, I shall present an analysis for each period separately. Accordingly in each of these evaluations I will focus on Quine's arguments with respect to Carnap's particular period.

Before going on, I would like to appeal to a distinction Quine makes between the two theses of logical truth. In "Carnap and Logical Truth" Quine distinguishes between two theses: *syntactical specifiability of logical truth* and *linguistic doctrine of logical truth*. He defines the former as follows: the thesis that explains the notion of logical truth as a specification of some sentences as logical truth "with the help of the general notion of truth together with a partial enumeration of the logical vocabulary of a particular language" (Quine (1954) 128). For the latter, *linguistic doctrine of logical truth*, Quine explains that this thesis has a further claim; that is, logical truths are grounded in language. Quine attributes the former thesis to Carnap's conception of analyticity in *Logical Syntax* and the latter to Carnap's thesis of logical truth after his semantical turn, mainly to *Meaning and Necessity*.

In sections 2 and 4, I have also noted a similar difference in Carnap's conception of analyticity between his two periods. Accordingly there is a parallelism between Quine's former characterisation (i.e. *syntactical specifiability of logical truth*) and what I have called *methodological notion of analyticity* and between his latter characterisation (i.e. *linguistic doctrine of logical truth*) and what I have called *methodological notion of analyticity*.

Part I. The Period of Syntax

In the period of syntax, as I discussed in section 2, Carnap's conception of analyticity has a methodological significance rather than an epistemological one. Carnap tries to give a syntactical specification of analytic sentences of a language system. According to Carnap, methodological concerns about scientific activity could be analysed through the syntactic analysis of the language of science. Accordingly the syntactical specification of analytic sentences is constituted of the specification of the linguistic framework which forms the scaffolding of a scientific theory. It has a methodological significance rather than an epistemological one. Our previous interpretation of Carnap's conception of analyticity is then compatible with Quine's former characterisation of the thesis of logical truth; that is, *the thesis of syntactical specifiability of logical truth*, if logical truth is understood in a relatively broader sense including mathematical truths.

However, the distinction between analytic and synthetic truths, depends on a prior distinction between logical and extra-logical (descriptive) terms of that language. As explained in section 2.d, Tarski convincingly argued that such a distinction cannot be given on objective grounds; for this reason the definition of "logical consequence" and correspondingly that of "analyticity" are not materially adequate. In the quotation from *Introduction to Semantics* given at the beginning of section 3, Carnap also admits that the distinction is not yet a proper one. But Carnap hopes that further semantic studies can provide the means for making the distinction in an adequate way. Accordingly we have concluded that one of Carnap's expectations from semantics is to provide the means to distinguish logical terms from descriptive ones.

Quine also indicates the same specification problem in "Carnap and Logical Truth", as I mentioned in section 5. But he thinks that as long as we restrict logical vocabulary to that of modern logic, it is tolerable to talk about the specifiability of logical truths, which is narrower than the intended scope of analyticity. For Carnap the scope of analyticity is still broader than logical truth in the narrow sense. Let us first consider the scope of analyticity in Carnap's period of syntax.

I agree with Quine that in *Logical Syntax* Carnap's intention was to show that logicomathematical truth is syntactically specifiable within a language, so 'analytic' was meant to capture not only logical truths in the narrow sense but truths of mathematics as well. In other words, "analytic" had a broader scope so as to capture logicomathematical truths within a language system. Here let me remind that Carnap's syntactic conception of *analytic* for language II can be interpreted as proceeding along the same lines as Tarski's semantic conception of *truth* applied to language II. Quine argues that so construed, the thesis that logico-mathematical truth is syntactically specifiable becomes uninteresting, for it simply says that it is specifiable in a notation consisting of the logico-mathematical vocabulary.¹⁵ So he assumes the very distinction that it aims to explain. So construed, says Quine, no special trait of logic and mathematics has been singled out after all.

Quine rightly argues that this thesis would hold equally well if 'logico-mathematical' were broadened to include physics, economics etc. Let us remember that the languages I and II that Carnap investigates in *Logical Syntax* are L-languages, which means that they only include logical rules (L-rules). Therefore, all and only analytic sentences are syntactically specified sentences, i.e. valid sentences, in these

¹⁵ See Quine (1954) esp. 125

languages. But what would the situation be for physical languages which also include physical rules? One may think that only rules of logic and mathematics (L-rules) are based on convention but that physical rules are indeed determined by empirical facts. However Carnap himself realises that in a physical language system (P-language) not only L-rules which lead to the specification of analytic sentences but some other rules which contribute to the derivation of synthetic sentences may have conventional character. Carnap calls these rules as P-rules. P-rules share the same methodological significance as L-rules. Their postulation is also a convention. In this case the specification of sentences based on both of these rules, which are conventionally postulated, is the specification of valid sentences, which can be either L-valid or P-valid, of that language. The particular specification of analytic sentences (L-valid) is troublesome since the distinction between L-rules and P-rules is not specified. Moreover, the distinction between P-valid sentences which are part of synthetic sentences and the rest of synthetic sentences is not specified either. For Llanguages, all and only analytic sentences are valid in them and the distinction between the analytic and the synthetic sentences is based on the distinction between logical and descriptive terms, which can not be specified properly. However, the problem for P-languages is more serious since the problem is not only that of the specification of logical vs. descriptive vocabulary. In P-languages, for the specification of analytic sentences in particular, we need a specification of a difference between L-rules and P-rules as well. There is yet another problem; that is, the question of capturing the difference between P-valid sentences and other synthetic sentences. In a sense we need a further criterion that distinguishes between P-rules and other rules of physics. Not all of the rules of physics can be called P-

rules; otherwise, all of the sentences of physics would be determined by P-rules, i.e. whence by convention.

According to Quine, the thesis of convention would hold equally well for the theoretical postulates of physics, with the cost of losing the speciality of conventionality of logico-mathematical postulates. However, as far as our interest is methodological rather than epistemological, Carnap's analysis (based on "convention", "consequence", "L-rules", "P-rules", etc.), contributes much to improve our understanding of scientific activity and the structure of scientific theories as well. Someone who seeks an epistemological explication from conventionalism would not be satisfied with Carnap's analysis. Considering the period of syntax, Carnap's thesis of convention is restricted to a methodological significance. He does not aim to provide an answer to the problem of warrant. His principle of tolerance, as I explained in section 2, aims to put aside the foundational problems of these rules in terms of meaning and justification. There is a freedom *in the activity of postulation*, but this conventionalism in postulation is not connected with "truth by convention" attributed to the sentences.

More explicitly, Carnap does not yet undertake the epistemological corollary of linguistic doctrine of logical truth that logical truths are grounded in language, in meanings, convention etc. That is why Carnap does not bother to count some basic physical rules among conventions. According to Carnap, these rules, though postulated conventionally, are not yet true by virtue of linguistic convention. They contribute to the formation of scientific hypotheses, which are empirically tested in a holistic manner. Contrary to many others, I believe that Carnap's investigations in *Logical Syntax* are still philosophically important especially for philosophy of

science. Though these specifications cannot be given explicitly in a *formalized* way, still they fall under the scope of fruitful philosophy. Carnap aims to give syntactical specifications, but his analysis goes beyond the scope of formal treatment of syntax. It may seem that this is why Carnap had failed. On the contrary, I think, this is what grounds Carnap's success. These conceptions, though cannot be specified syntactically, are still philosophically important in so far as they broaden our understanding of the methodology of science and of the role of convention in scientific hypothesis. In a word, the problem is aiming *syntactic* definitions not the absence of such definitions.

Part II. The Period of Semantics

After his semantical turn, Carnap establishes a close connection between semantics and epistemology from an empiricist point of view. He transforms the so-called verification theory of meaning into what he calls the *principle of empiricism*. But even in this revised version, the thesis includes three implicit assumptions: the unit of confirmation (verification) is a sentence, the meaning of a sentence is the way we determine its truth, and a sentence is meaningful only if such a determination is possible. The unit of meaning and also that of confirmation accordingly are supposed to be individual sentences; and semantics, as a theory of meaning, is supposed to illuminate the conditions under which a sentence can be confirmed. The presumed close connection between semantics and epistemology accordingly leads to a shift in Carnap's conception of the analytic/synthetic distinction. This distinction from then on started to carry an epistemological significance as well. This can be seen in the new terminology, "logical" versus "factual" truth. Logical truths are grounded in language and are true because of linguistic reasons, and factual ones are grounded in facts and are true due to empirical reasons. This is exactly what Quine points out when he says that "the semantical attribute of truth, in particular, is one, which, according to Carnap is grounded in language, in convention, fiat, meaning" (Quine (1954) 126). In other words, Quine notes that after his semantical turn, Carnap replaces his thesis of syntactical specifiability of logical truth with the linguistic doctrine of logical truth, which the latter is an epistemological doctrine.

In Meaning and Necessity Carnap's new definition of logical truth is based on statedescriptions. In the "Two Dogmas", Quine argues that this expedient works for a specification of logical truth in a relatively narrow sense but not of analyticity in the broad sense which includes the truths based on essential predication.¹⁶ In Meaning and Necessity, Carnap gives a definition of synonymy based on the notion of property, which is similar to what Quine calls "essential predication". Carnap describes the "intention of a predicator" by the corresponding property and he emphasises that by "property", we shall understand "the physical character of the thing which the physicist explains as a certain disposition to selective reflection, not that of psychological character of the observer" (Carnap (1947) 20). Carnap defines that the two predicators have the same intention if and only if they are L-equivalent and L-equivalence is the equivalence relation which is L-true. In sum, Carnap explains that two predicators are synonymous if and only if the equivalence of their intentions is L-true. This definition can be exemplified as follows: 'bachelor' and 'unmarried man' are synonymous if and only if 'All and only bachelors are unmarried men' is L-true.

This formulation is very similar to one of the accounts that Quine criticises in the "Two Dogmas": To say that 'bachelor' and 'unmarried man' are cognitively synonymous is to say that 'All and only bachelors are unmarried men' is analytic. The argument given in this way, says Quine, is like a closed curve in space since it presupposes analyticity. To the extent that it presupposes analyticity, it cannot explain the notion of cognitive synonymy, which is supposed to explain analyticity. In a footnote Quine warns us that this account would not work for the *cognitive synonymy in the broad sense*. He also a makes a reference to Carnap and notes that "Carnap has suggested how, *once this notion is at hand*, a narrower sense of cognitive synonymy which is preferable for some purposes can in turn be derived. But this special ramification of concept-building lies aside from the present purposes and must not be confused with the broad sort of cognitive synonymy here concerned" (Quine (1951)28).

The key point is whether Carnap builds up his concept of synonymy for an artificial language by presupposing the notion of cognitive synonymy in the broad sense. There seems to be two alternatives for Carnap: either he presupposes cognitive synonymy in the broad sense (for English; say), that is; one will grasp synonymy relations once one knows English, or synonymy pairs must be given explicitly among the rules of language. In the period of *Meaning and Necessity* Carnap's position was the former, and after Quine's criticisms Carnap developed the concept of "meaning postulates"¹⁷ and shifted to the latter point of view. From then on Carnap thought that the relation between the concepts of a language must be laid down explicitly as conventions, as "meaning postulates".

¹⁷ See Carnap (1952b)

In Meaning and Necessity Carnap does not yet count meaning postulates among the semantic rules of a language. Carnap's semantic rules do the work of assigning meaning to the signs of artificial language under construction. More explicitly they attribute a meaningful expression of English language to each meaningless sign of the language created. In this way Carnap presupposes that these expressions that are matched to our artificial signs would be grasped by anyone who spoke English. He also presumes that meaning relations among the terms of our artificial language will hold in the same way that they hold between their English counterparts. For instance, if the meaning for predicate 'Bx' of our artificial language is stated as 'x is a bachelor' and 'UMx' is interpreted as 'x is an unmarried man' then the predicators 'B' and 'UM' would be L-equivalent (synonymous) if and only if '(x) $[Bx \equiv UMx]$ ' is L-true. More explicitly, 'B' and 'UM' are synonymous if and only if "For all x, if x is a bachelor then x is an unmarried man" is true in all state descriptions. But this strategy works if "bachelor" and "unmarried man" are synonymous in English. Therefore, Carnap thinks that a broader notion of cognitive synonymy is already at hand for his explication of L-equivalence (synonymy) for an artificial language system constructed. For this reason, Carnap's conception of L-truth is open to Quine's objections. In other words, Quine is right in his requirement for the explication of the "cognitive synonymy" that Carnap presupposes for his definition of L-equivalence. For logical truth in the narrow sense, Quine agrees that once the logical vocabulary is given, we have a means of clearly marking of the logical truths within the genus of truth. Still this does not lead to the conclusion that logical truths are true by virtue of linguistic convention. Quine argues that in case of analyticity, not merely an epistemological question concerning it but also the specification itself is in trouble. To specify analyticity Quine insists that we need an account of

synonymy "throughout a universal or all-purpose language" and Carnap's attempt (in *Meaning and Necessity*), according to Quine, is restricted to "illustrative examples, and is fragmentary in scope" (Quine (1954)130). Quine argues that even if there were one, it is not clear by what standards we would care to settle questions of synonymy.

After Quine's objections, Carnap developed the idea of "meaning postulates" which provide the meaning relations among the descriptive terms of a language constructed. For instance, considering the example above ('B'; bachelor, 'M'; married man), we shall add to the semantic rules of our artificial language the meaning postulate: '(x) (Bx Mx)'.¹⁸ In this way Carnap proposes that once the postulates for all such relations are laid down explicitly, they will assign as much meaning to the descriptive terms as is essential for analyticity.

I will try to show how Quine's objections to Carnap's conception of "semantic rule" can be modified to apply to Carnap's manoeuvre via of "meaning postulate". Let us assume that sematic rules together with meaning postulates (and some other rules of logic) are laid down explicitly for a language system so that they specify analytic statements by recursion or otherwise, for an artificial language in the way Carnap proposes. They may mark some sentences as analytic for that specific language. But the sense of the general relative term 'analytic for', nevertheless, would not be clear. The sentences would be specified and called analytic, due to the rules and postulates we have provided artificially. Analytic sentences for a language system would turn out to be the true statements according to the semantic rules and meaning postulates given for *that particular language system*. Then the problem is the same with that of

¹⁸ For a similar analysis see Carnap (1952)224
semantic rules. We do not know what it makes a postulate, a meaning postulate for a given language system. We need an account for the general term, "meaning postulate of" L (i.e. any language system) likewise we need for the general term "semantic rule of". Accordingly, meaning postulates do not broaden our understanding of "cognitive synonymy". We still need an account of synonymy throughout a universal language. Otherwise, we just specify some postulates rigorously as "meaning postulates". The sentences that are implied by these rules (together with semantic and logical ones) become anallytically true. As long as we don't have an account of a general term 'meaning postulate of', or 'semantic rule of' throughout a universal or all-purpose language, we do not actually specify a special kind of truth but rather label some of the truths for the language considered as "analytic truths".¹⁹

The problem is not merely whether or not we can assign a truth-value to the sentence "all bachelors are unmarried" without referring to the facts. It seems hopeless to give a universal account of cognitive synonymy in a formalised way, which will apply to all the synonymous pairs within a natural language. The main problem is not the absence of a universal account of "cognitive synonymy" that will capture *natural languages*. Carnap emphasises the same point and claims that his analysis is proper for artificial languages rather than natural ones. But then what we expect is that artificial languages must be significant for understanding the nature of scientific

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¹⁹ Quine also mentions that the revision obtained by introducing the notion of meaning postulates can not overcome the problems that the conception of analyticity faces. Considering Carnap's latest position Quine says: "one has specified a language quite rigorously only when he has fixed, by dint of so-called meaning postulates, what sentences are to count as analytic" (Quine (1954) 130).

theories. This is exactly where the trouble lies; the significance of artificial languages for the analysis of theories of natural sciences.²⁰

A clear distinction of factual and analytic truth with respect to a theoretical language of natural sciences is problematic since the meaning postulates for descriptive terms have a dual role: they fulfil the function of giving meaning to these terms and giving factual information to us simultaneously. On the one hand, if the postulates for descriptive terms give meaning to these terms, then they fulfil the function of what Carnap calls "meaning postulates" which, according to Carnap, are conventions and whence true by virtue of language. On the other hand if they give factual information then it is odd to count them as true by convention since in so far as they provide empirical knowledge an empiricist would count them true by virtue of empirical facts. Neither of these alternatives seems satisfactory, since these postulates have a dual role. And as long as they have a dual role, there is a problem for the epistemic corollary to the thesis of logical vs. factual truth, aimed at theoretical language of physics.

Let us exemplify the nature of the problem for a sentence of natural science.²¹ Take the sentence S "All woodpeckers are birds". Is this a factual or an analytic sentence? Can there be a woodpecker that is not a bird? Such a question gives us the impression that the meaning of 'woodpecker' presumably includes "being a bird". In other words, "being a bird" is one of the "essential predicates" for a "woodpecker". If so, then S is an analytic sentence since there cannot be any woodpecker, which is not a bird. But the meaning relation between these two concepts is assumed to reflect

²⁰ Hempel is the one who has first questioned the implication of Carnap's work for the philosophy of science. See .Hempel (1954).

the factual relation between the natural kinds called woodpeckers and birds. There is a sense that the reason why we have called birds as 'bird' but not as 'flyer' is a linguistic convention. But the case is not same when we call a woodpecker as a kind of bird. 'All woodpeckers are birds' is not true because of the meanings of the terms it includes but true because of the empirical facts. According to Carnap, someone who understands what it means to be a 'woodpecker' and to be a 'bird', would certainly admit that 'all woodpeckers are birds' is true without reference to the facts of the world. But the reason why we attribute truth to the sentence 'All woodpecker are birds' is because we already believe that woodpecker is a kind of bird. We do not believe that this sentence is true because of linguistic reasons; rather, we believe it because of empirical reasons. The truth of the meaning relations among the descriptive terms used in natural sciences actually depends on the supposed factual truths. Therefore the justification of the truth of these meaning postulates depends on empirical evidence rather than mere linguistic convention.²²

There might yet be a genuine kind of synonymy relation. This kind of strict synonymy relation is either "cognitive synonymy" which holds for natural languages (e.g. "unmarried man" and "bachelor") or "sheer abbreviation" which holds for deductive sciences (wherever one can use the term 'square root' one can use 'sqrt' instead). In any of these forms, either it not used within language of empirical science at all or even if it is used it does not contribute much to the epistemological analysis. Introducing strict synonymous pairs by convention, (e.g. introducing 'mird' as strictly synonymous with 'bird') within an empirical theory would just mean to

²² The origins of these thoughts go back to Putnam and Kripke

²¹ Let us also assume that "woodpecker" is a theoretical term in science that needs explication.

populate the terms of the language by using two terms to denote the same kind of entity.

To summarize, the first type of meaning postulate that gives meaning to a descriptive term and conveys factual information at the same time cannot be taken as the ground for linguistic convention in so far as it has both a semantic and a factual role. The second type of meaning postulate, which is created artificially, for the purpose of strict synonymy, is insignificant for philosophy of science in so far as it does not convey any genuine information at all.

In his period of syntax Carnap did not appeal to convention as an explanation of the so-called a priori vs. empirical (a posteriori) truths. However in his period of semantics, this further connection is provided with the *principle of empiricism*, for which the unit of meaning and also that of confirmation are supposed to be individual sentences. According to the principle of empiricism, a sentence is meaningful only if it can be confirmed by empirical evidence. Semantics, as a theory of meaning, is supposed to illuminate the conditions under which a sentence can be confirmed. This supposedly close connection between semantics and epistemology also leads to a shift in Carnap's conception of the analytic/synthetic distinction among the sentences. This distinction from then on started to carry an epistemological significance as well. Logical truths are grounded in language and are true because of linguistic reasons, and factual ones are grounded on facts and are true due to empirical reasons.

According to Carnap, factual sentences give information about the world, are true by virtue of facts and can be confirmed by empirical evidence. In this way synthetic and a posteriori sentences become co-extensive. Once Carnap opposes analytic truths to factual ones, which are synthetic a posteriori, they immediately gain an epistemic significance as well; analytic sentences are supposed to be true by virtue of language, by convention. In this way Carnap's understanding of convention is also revised. In the period of syntax, his conception of convention did not aim to provide solution to the problem of justification. On the contrary, Carnap thought that in so far as logical rules are considered to be conventions the question of justification does not arise at all. For Carnap there is not a question of truth for these rules, but of technical expedience, and this choice must be based on pragmatic reasons.

But after his semantical turn, Carnap changed the role of convention within his language analysis. Convention is now an account for the warrant of sentences which are not factual. Conventional choice of the meanings of the expressions of a language system, which, according to Carnap, also determine the conditions under which a sentence would be true, explains why analytic sentences are true under all conditions i.e. they will be true under any condition in virtue of meanings of the expressions (both logical and descriptive) occurring in them.

As a conclusion, in so far as Carnap promises to illuminate matters of justification, his conception of analyticity carries the problems explained thus far. At the root of the problem lies the idea that matters of justification can be explicated through semantic analysis. Within this perspective Quine, as long as he questions the epistemological significance of analyticity, his objections are acute. However, this conclusion cannot be broadened so as to capture Carnap's period of syntax. As explained before; that is, mainly because Carnap does not aim to give any explanation for matters of justification in his syntactical analysis. His conception of analyticity is guided by methodological concerns rather than epistemological. However, as it has been shown the analytic/synthetic distinction was based on the distinction between the logical and the extra-logical expressions. The specification of this latter distinction is problematic if one expects the distinction to be given in a formal manner (syntactic). It seems to me that philosophical investigations need not be restricted to formal definitions in so far as these distinctions can still illuminate the area under investigation. Quine himself also appeals to an informal specification of logical terms, which weakens his requirement for a formal specification of synonymy pairs. Accordingly, Carnap's careful analysis in LSL depending on the concepts such as 'convention', 'principle of tolerance', 'analyticity', 'L-rules', 'Prules' provides us with a sensible story about the methodology of science. Carnap's conceptual analysis in LSL, which actually exceeds the limits of syntax, can be seen to be fruitful only if Carnap's own expectation from philosophy as being a formal investigation is not expected. I would like to end the discussion with Carl G. Hemple)s insightful analogy for Carnap's contribution to "the logic and methodology of science":

... the quest for an ever more adequate statement and defense of some of the basic conceptions of empiricism has come to play the role of the treasure hunt in the tale of the old winegrower who on his death-bed enjoins his sons to dig for a treasure hidden in the family vineyard. In untiring search, his sons turn over the soil and thus stimulate the growth of the vines: the rich harvest they reap proves to be the true and only treasure in the vineyard (Hempel (1963) 707).

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