Carnap's Aufbau *Reconsidered*

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Rudolf Carnap's *Der logische Aufbau der Welt*[1], written largely in the years 1922-25 and published in 1928, is generally—and rightly—regarded as one of the most important classics of twentieth century positivist thought. But what exactly is the importance of this great work? Precisely where does its significance lie?

The most widely accepted view of this question, I think, runs as follows. Central to twentieth century positivism is the doctrine of verificationism: the doctrine that the cognitive meaning of all scientific statements must ultimately consist in their consequences for actual and possible sense experiences. And it is this radically empiricist doctrine, above all, that forms the basis for the notorious anti-metaphysical attitude of twentieth century positivism: in virtue of their unverifiability, metaphysical statements are deprived of all cognitive meaning as well. Yet this radically empiricist program also requires a positive construction, for one must show how the non-metaphysical statements of science and everyday life are actually translatable into terms referring only to sense experiences. In other words, twentieth century positivism requires a phenomenalistic reduction.

The *Aufbau*, on this reading, is primarily important for its attempt at just such a phenomenalistic reduction:

> Radical reductionism, conceived now with statements as units, set itself the task of specifying a sense-datum language and showing how to translate the rest of significant discourse, statement by statement, into it. Carnap embarked on this project in the *Aufbau*.[2]

On this reading, then, the *Aufbau* is best seen as an exceptionally detailed and rigorous attempt to execute concretely the program of Russell's *Our Knowledge of the External World* (1914):

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> To account for the external world as a logical construct of sense data—such, in Russell's terms, was the program. It was Carnap, in his *Der logische Aufbau der Welt* of 1928, who came nearest to executing it.[3]

Such, as I have said, is the most widely accepted view of the *Aufbau's* significance.

It is also widely accepted, however, that the *Aufbau* fails in this reductionist project. At a crucial point—precisely where one moves from private sense experience to physical objects, in fact—the construction breaks down decisively; and, in particular, we are no longer presented with explicit definitions or translations at all.[4] Moreover, this failure is clearly acknowledged, with characteristic honesty and rigor, by Carnap himself.[5] From this point of view, then, the ultimate significance of the *Aufbau*—its significance for us—lies in its precise and rigorous exhibition of the failure of phenomenalistic reductionism. The *Aufbau* shows us exactly what is wrong with radical empiricism and verificationism and, therefore, prepares the way for more liberal and holistic conceptions.[6]

I think that this widely shared conception of the primary aim and significance of the *Aufbau* is fundamentally misguided. It is true, of course, that the *Aufbau* contains an important attempt at a phenomenalistic reduction. It is also true that this attempt fails. Yet focusing attention exclusively on the issue of phenomenalism leads to a serious distortion of the true philosophical context and real philosophical motivations of Carnap's work. As a result, we have distorted the philosophical context and motivations lying behind the development of twentieth century positivism as well.

I

The *Aufbau*, as we have seen above, is supposed to be first and foremost a contribution to radical empiricism. By applying the powerful new tools of modern logic, the theory of relations and set theory, its principal aim is to give new rigor and force to traditional empiricist doctrine. But there are several obvious features of the text that do not cohere at all well with this picture.

First of all, much of the actual logical construction in the *Aufbau* takes place within the domain of private sense experience: the domain Carnap calls the "autopsychological." Carnap begins with unanalyzed momentary cross-sections of experience—"elementary experiences"—that are related to one another by a two-place relation Rs of "recollection of similarity" (§78). Using a complicated procedure of "quasi-analysis" (§§67-74), he attempts to divide the elementary experiences first into "quality classes"—whose elements

all agree in containing a particular sensation such as a blue spot in a given region of the visual field (§81)—and then into "sense classes"—which correspond intuitively to different types or modalities of sensations such as visual, auditory, tactile, and so on (§85). The next problem is to distinguish the different sense classes from one another, and this is done on the basis of dimensionality considerations: the visual field, for example, is the one and only sense modality having exactly five dimensions (§86). Carnap then proceeds to distinguish the three dimensional color subspace (hue-saturation-brightness) of the visual field from the two dimensional subspace of visual field places (§§88-89) and is now—and only now—in a position to talk about actual color sensations (§§90-93). It is at this point, finally, that Carnap attempts to step beyond the domain of the autopsychological into the external or physical world: in essence, by projecting color sensations onto the objects in three dimensional space to which they correspond (§94, §§125-128).

Note that Carnap does not begin, as in much traditional empiricism, with sensations or sense-data such as color patches and the like as basic or primitive elements. Under the influence of holistic and Gestalt ideas (§67, §75) he explicitly rejects such primitive sensory "atoms," and instead arrives at concrete sensations only at the end of an intricate construction (§93). It is here, in fact, that Carnap introduces his main technical innovation: the procedure of quasi-analysis, which attempts to do for *similarity* relations what Frege and Russell have done for *equivalence* relations (§40, §§70-73).[7] Yet, if Carnap's main goal is really the vindication of phenomenalistic reductionism, why should he spend so much time and technical ingenuity on an elaborate construction that takes place entirely within the domain of private experience? Why does he not simply take concrete sensations as primitive[8] and devote himself instead to a more detailed treatment of the construction of the physical world out of such sensations?

A second and more fundamental factor militating against a straightforwardly phenomenalistic reading of the *Aufbau* is this. There is no doubt that, despite the peculiarities of Carnap's procedure just noted, the *Aufbau* does present a phenomenalistic system. The construction begins from a solipsistic or autopsychological basis (§§64-66) in the private sense experience of a single individual, and it proceeds by attempting explicitly to construct everything else—first the physical world (§§125-128) and then even other individuals with their own private sense experiences (§§145-148)—from this initial autopsychological basis alone. Yet Carnap stresses repeatedly that the specific system he presents is only one possible "constructional system" [Konstitutionssystem] among many others (§§57-63,

§122). In particular, a constructional system built on a physical rather than an autopsychological basis is equally possible and legitimate (§57, §59, §62). It is possible, according to Carnap, to construct a phenomenalistic system in which everything is reducible to private experience; it is equally possible to construct a materialistic system in which everything—including private experience—is reducible to the objects of physics (§57, §62).

A constructional system built on a physical basis has, in fact, important advantages over a phenomenalistic one. Such a system starts from "the only domain (namely, the physical) which is characterized by a clear regularity of process," and hence "from the standpoint of empirical science the constructional system with physical basis constitutes a more appropriate arrangement of concepts than any other" (§59). It is also true, however, that a phenomenalistic system has important advantages over a physicalistic system; for the former reflects what Carnap calls "epistemic primacy," that is, the order in which objects come to be known in the process of cognition (§54). Since, according to Carnap, physical objects are known through the mediation of autopsychological objects but not vice versa, it follows that an autopsychological basis is most appropriate from an epistemological viewpoint (§§59-60, §64).

Now Carnap chooses to investigate a system with an autopsychological basis, because of his "intention [Absicht] to have the constructional system reflect not only the logical-constructional order of the objects, but also their epistemic order" (§64). It is clear, however, that this choice [Wahl] is just that—and is not in any way a philosophical necessity, as it were, stemming from an antecedent commitment to phenomenalism as a philosophical doctrine.[9] Indeed, Carnap explicitly and repeatedly disclaims any such commitment (§60, §§175-178). The general discipline Carnap is here instituting and exemplifying—the discipline of "construction theory" [Konstitutionstheorie]—is entirely neutral with respect to all such "metaphysical" questions (§§177-178); and one important aspect of this neutrality is that construction theory is interested equally in all possible forms of constructional system, not just in a phenomenalistic form. Thus, while there is no doubt that Carnap does wish to demonstrate the possibility of a phenomenalistic system in the *Aufbau*, construction theory itself has a much more general aim: to show "the possibility, in general, of a constructional system" and "the possibility, in principle, of translating all scientific statements into statements within a constructional system" (§122).

This last point is so important to Carnap that he reemphasizes it at length in his description of the writing of the *Aufbau* in his intellectual autobiography in the Schilpp volume.[10] He stresses that

for him phenomenalism, materialism, and so on are merely so many "ways of speaking", representing nothing more than pragmatically motivated choices of language, and he asserts the neutral character of construction theory most explicitly:

> When I developed the system of the *Aufbau,* it actually did not matter to me which of the various forms of philosophical language I used, because to me they were merely modes of speech, and not formulations of positions. . . . The system of concepts was constructed on a phenomenalistic basis . . . However, I indicated also the possibility of constructing a total system of concepts on a physicalistic basis. The main motivation for my choice of a phenomenalistic basis was the intention to represent not only the logical relations among the concepts but also the equally important epistemological relations. The system was intended to give, though not a description, still a rational reconstruction of the actual process of the formation of concepts . . . The ontological theses of the traditional doctrines of either phenomenalism or materialism remained for me entirely out of consideration.[11]

It is therefore clear beyond the shadow of a doubt, I think, that the *Aufbau* has a much more general aim than the particular construction of a phenomenalistic system.

Yet there is a strong temptation to distrust such Carnapian claims to ontological neutrality, a temptation that stems, I think, from the idea that the anti-metaphysical attitude of the positivists must rest ultimately on verificationism and radical empiricism. From this point of view, a phenomenalistic system must have a central and privileged place after all, and Carnap's attempt to distance himself from traditional phenomenalism must be seen as a sham. Perhaps, however, it is not Carnap, but rather the idea that an anti-metaphysical attitude must rest on radical empiricism, that is at fault here. Indeed, in view of the fact that Carnap persists in his anti-metaphysical attitude long after he explicitly acknowledges the failure of phenomenalistic reductionism and radical empiricism, this latter alternative should appear much more plausible. My own view is that Carnap's anti-metaphysical attitude is not in the end based on empiricist doctrines at all, but rather on precisely the attempt to find a peculiarly philosophical vantage point that is neutral with respect to all traditional metaphysical disputes. That is, Carnap does not ultimately reject the metaphysical tradition on crudely verificationist grounds, but rather because he thinks he has found a replacement—a "scientific" replacement—for metaphysics.[12]

II

If the primary aim of the *Aufbau* is not the construction of a par-

ticular form of phenomenalistic system—if the aim of construction theory is really much more general—what then is this aim?

In §1 Carnap explains that the aim of construction theory is to attempt

> a step-by-step derivation or "construction" [Konstitution] of all concepts from certain fundamental concepts, so that a genealogy of concepts results in which each one has its definite place. It is the main thesis of construction theory that all concepts can in this way be derived from a few fundamental concepts, and it is in this respect that it differs from most other ontologies [Gegendstandstheorie].

This method, as he explains in §2, will lead to the goal of a unified science. But why is this so important? At the end of §2 we find the following cryptic remark:

> Even though the subjective origin of all knowledge lies in the contents of experience and their connections, it is still possible, as the constructional system will show, to advance to an intersubjective, *objective world*, which can be conceptually comprehended and which is the same for all observers [emphasis in the original].

This remark, in my view, encapsulates the most fundamental aim of the *Aufbau*: namely, the articulation and defense of a radically new conception of objectivity.

Carnap's conception of objectivity emerges in the next several sections, where it is explicitly connected with the notion of logical form or structure. Thus, in §6 Carnap states his goal this way: "It will be demonstrated that it is in principle possible to characterize all objects through merely structural properties (i.e., certain formal-logical properties of relation extensions or complexes of relation extensions) and thus to transform all scientific statements into purely structural statements." Section 10 begins: "In the following, we shall maintain and seek to establish the thesis that *science deals only with the description of structural properties of objects*." The connection between logical form or structure and the notion of objectivity is made most explicitly in §16:

> each scientific statement can in principle be transformed into a statement which contains only structural properties and the indication of one or more object domains. Now, the fundamental thesis of construction theory (cf. §4), which we will attempt to demonstrate in the following investigation, asserts that fundamentally there is only one object domain and that each scientific statement is about the objects in this domain. Thus, it becomes unnecessary to indicate for each statement the object domain, and the result is that *each scientific statement can in principle be so transformed that it is nothing but a structure statement*. But this transformation is not only possible, it is im-

> perative. For science wants to speak about what is objective, and whatever does not belong to structure but to the material (i.e., anything that can be pointed out in a concrete ostensive definition) is, in the final analysis, subjective. . . . From the point of view of construction theory, this state of affairs is to be described in the following way. The series of experiences is different for each subject. If we want to achieve, in spite of this, agreement in the names for the entities which are constructed on the basis of these experiences, then this cannot be done by reference to the completely divergent content, but only through the formal description of the structure of these entities.[13]

Thus, for Carnap, construction theory, the unity of science—what he calls "the unity of the object domain" in §4—logical form or structure, and scientific objectivity are intimately connected. Our problem is to understand the nature and significance of this connection.

Carnap introduces the concept of the form or structure of a relation in §11. The structure of a relation is the class of all relations that are isomorphic to it, or, what comes to the same thing, the totality of its formal properties—properties such as symmetry, reflexivity, transitivity, connectedness, and so on that can be expressed using only purely logical notions. The underlying idea, of course, is that two different relations—relations that differ in "content" [inhaltlicher Sinn]—such as the relations of later-than defined between moments of time and being-to-the-right-of defined between points on a line, for example, may have exactly the same logical form or structure (in this case, both relations are continuous linear orderings). So far, then, the idea is a perfectly standard and familiar part of the modern theory of relations.

In the next several sections, however, Carnap argues that only the logical form or structure of a relation is objectively or scientifically communicable: any excess "content" going beyond logical structure must rest ultimately on ostensive definitions, and these, according to Carnap, provide no intersubjective meaning. For truly objective communication, then, we must require that all relations are given only through descriptions of their structure—through what Carnap calls "purely structural definite descriptions" (§§12-15). Thus, "within any object domain, a unique system of definite descriptions is in principle possible, even without the aid of ostensive definitions. . . . any intersubjective, rational science pre-supposes this possibility" (§13); and "*a definite description through pure structure statements is generally possible to the extent to which scientific discrimination is possible at all*" (§15).

This last idea appears highly paradoxical, of course, for the no-

tion of logical form or structure is such that two different relations—such as the temporal order and the spatial order on a line—may have precisely the same formal structure. How, then, can two such relations be discriminated from one another solely on the basis of structure? Here is where the "fundamental thesis of construction theory" comes into play: if we imbed all relations within a single global structure of relations, then we may hope to be able to discriminate (according to Carnap we *must* be able to discriminate) formally identical relations through their differing formal "places" within this all-encompassing global structure (see §§14-15). Thus, for example, while the temporal order and the spatial order on a line are "locally" structurally identical (both are continuous linear orderings), the latter occurs as a subspace of the total three dimensional spatial order whereas the former does not; moreover, within the global space-time manifold the temporal dimension is itself formally distinguishable from the three spatial dimensions; and so on.

This is why the unity of science—the unity of the object domain (§4)—is so important to Carnap. It is only if all concepts are part of a single interconnected system of concepts that we can hope to do what, according to Carnap's new conception of scientific objectivity, we must do: discriminate all concepts from one another solely on the basis of their purely formal or structural properties. This also explains the at-first-sight extremely peculiar method of definition Carnap actually employs in the *Aufbau*. Beginning with the two-place relation *Rs* of recollection of similarity, he divides the elementary experiences first into quality classes and then into sense classes or sense modalities. Each sense modality is ordered by a two-place similarity relation which, according to Karl Menger's topological definition of dimensionality,[14] can be assigned a dimension number. The visual field is then picked out from all other sense modalities by the purely formal properties of its associated dimension number: namely, the visual field, according to Carnap, is the unique sense modality having exactly five dimensions (§86: all other sense modalities have either two, three, or four dimensions). We then pick out the three dimensional color subspace of the visual field from the two dimensional subspace of visual field places by similar purely formal considerations (§§88-91); but even so, we are not yet in a position formally to define the various individual colors. This, in fact, cannot be done until after we have constructed the physical world, wherein individual colors can be defined as the colors of various types of physical things: green is the color of foliage, for example (§134). Thus, Carnap does not begin his construction with sensations or sense-data precisely because even these entities must ultimately be defined on the basis of purely formal or struc-

tural properties—by their logical "places" within a single interconnected system of concepts.

Viewed from this perspective, Carnap's project has less affinity with traditional empiricism and more with Kantian and neo-Kantian conceptions of knowledge.[15] The primary problem is to account for the objectivity of scientific knowledge, and the method of solution is based on a form/content distinction. Scientific knowledge is objective solely in virtue of its formal or structural properties, and these properties are expressed through the "places" of items of knowledge within a single unified system of knowledge. The project is not *strictly* Kantian, of course, because the notion of form or structure in question here is a purely logical one, understood solely in terms of formal logic. For Kant himself, merely formal logic is quite inadequate for the constitution of objectivity, and we need to supplement it with a "transcendental logic" that makes essential reference to intuition: the "pure intuitions" of space and time. Now, in the context of the much more powerful conception of formal logic bequeathed to him by Frege and Russell, Carnap finds such an independent appeal to the "forms of intuition" quite unnecessary,[16] and space and time have no special status: they simply find their proper places in the constructional system along with all other concepts (§87, §§124-125). In other words, whereas Carnap retains the Kantian connections among objectivity, the notion of form or structure, and the a priori (for formal logic is itself certainly a priori for Carnap), he now has no need whatever for Kant's *synthetic* a priori.

Nevertheless, it is of the utmost importance that Carnap's conception of knowledge and meaning is Kantian—and in fact quite opposed to traditional empiricism—in that it is "holistic" rather than "atomistic."[17] Concepts do not derive their meaning "from below"—from ostensive contact with the given. Indeed, such merely ostensive contact with the given is the very antithesis of truly objective meaning and knowledge; for objective meaning can only be derived "from above"—from formal or structural relations within the entire system of knowledge. Such a formalistic and holistic conception of meaning and knowledge is in fact widely held throughout the period—and held by thinkers who are generally regarded as paradigmatically empiricist. The conception plays a prominent role, for example, in Moritz Schlick's *General Theory of Knowledge* (1918) and other early writings,[18] in Russell's *The Analysis of Matter* (1927),[19] and in C.I. Lewis' *Mind and the World-Order* (1929).[20] All of these works disengage meaning and knowledge from ostension, and lodge them instead in the system of logical relationships among our concepts. All of these writers—including Carnap—are clearly indebted

to the notion of "implicit definition" deriving from Hilbert's axiomatization of Euclidean geometry (1899).[21] What distinguishes Carnap from the others is simply his rigorously constructive spirit: he transforms holistic and formalistic sentiments into a definite technical program for characterizing all concepts of science through purely structural definite descriptions formulated within a single constructional system.

This perspective on the *Aufbau* illuminates the two features of the text noted in §I above. It is clear, first of all, that logical construction is just as important within the purely private domain of the autopsychological as it is anywhere else. For this domain too has a formal or logical structure, and construction theory has the task of revealing all such structure. Indeed, in view of the fact that the domain of the autopsychological is, at first sight, the domain where purely ostensive meaning has a natural and proper place, the demonstration that even this domain can be characterized through its logical structure alone is especially important to Carnap; for only so do we see how scientific objectivity extends to all of our concepts. From this point of view, then, the step leading from the private domain of the autopsychological to the external domain of the physical has no special importance, and this explains why Carnap devotes so much more space and ingenuity to the former domain.

By the same token, it is also clear that other constructional systems besides the particular one Carnap attempts to construct here are equally important and legitimate. For any such system contributes equally well to the goal of revealing the logical structure of, and logical relations among, our concepts. What construction theory primarily seeks is a characterization of all concepts through their formal or structural properties, and, as we have seen, what this requires is the unity of science—the unity of the object domain. The choice of one particular object domain over others—a phenomenalistic domain in the autopsychological realm of private experience over a materialistic domain in the primitive entities of physics, for example—is then a matter of comparatively little significance. Scientific objectivity, according to Carnap, requires precisely such a unified system of purely structural definite descriptions; a phenomenalistic reduction of all concepts to the given is in no way essential.

III

If we are correct in our interpretation of the primary aim of the *Aufbau*, that is, the general goal of construction theory, then it follows that the failure of phenomenalistic reductionism cannot be the most fundamental problem facing the *Aufbau*. The real problems are cor-

respondingly more general and, I think, deeper.

The aim of construction theory is the characterization of all concepts of science through purely structural definite descriptions. We have briefly sketched the method by which the *Aufbau* attempts to achieve this aim above. Starting from the two-place relation *Rs* defined between elementary experiences, Carnap constructs the general class of sense modalities by quasi-analysis, and then picks out the visual field from all other sense modalities by means of its unique dimensionality. This construction then becomes the fixed point from which all other concepts are generated: first color classes and color sensations, then physical objects, and finally even other experiencing subjects with their own elementary experiences. What makes the entire system of purely structural definite descriptions possible, in other words, is the fact (according to Carnap) that the visual field is the unique sense class based on *Rs* having exactly five dimensions (see. §115, §119).

Yet the basic relations *Rs* is so far itself undefined: it is simply introduced as a non-logical primitive (see §108, §119). We have, to be sure, drastically reduced the number of non-logical primitives and have characterized almost all concepts purely formally or structurally. But the ultimate goal of construction theory still eludes us, for the scientific objectivity of the basic relation *Rs* has itself not yet been shown. Moreover, since all other concepts have been reduced to *Rs*, all we have really shown so far is that they are objective if it is. In other words, Carnap's program requires a *complete* formalization of all concepts of science, and we have achieved so far merely a partial (albeit still very impressive) formalization. Carnap raises this problem, and attempts to solve it, in §§153-155 (which are innocently labeled "may be omitted"). Thus:

> A purely structural statement must contain only logical symbols; in it must occur no undefined basic concepts from any empirical domain. Thus, after the constructional system has carried the formalization of scientific statements to the point where they are merely statements about a few (perhaps only one) basic relations, the problem arises whether it is possible to complete the formalization by *eliminating from the statements of science these basic relations* as the last non-logical objects. (§153)

As Carnap indicates, this problem will arise for any constructional system regardless of the choice of non-logical primitive(s), and it has no intrinsic connection whatever with the choice of a phenomenalistic system.

How is it possible to eliminate even the primitive non-logical concepts from a constructional system? The method that suggests itself to Carnap is again the method of implicit definition. In con-

structing other objects from our non-logical primitive(s) we will make essential use of certain empirical facts. In Carnap's system, for example, we make essential use of the (putative) fact that there is one and only one sense modality based on *Rs* that is exactly five dimensional. Now, Carnap claims, by ascending to high enough levels in our constructional system, we may hope to find sufficient such empirical facts to uniquely characterize our chosen basic concept(s) in contradistinction to all other possible basic concepts (§153). We could define *Rs*, for example, as the unique basic relation that is such that there is one and only one sense modality based on it having exactly five dimensions.[22]

What we have done, in effect, is eliminated the constant relation *Rs* in favor of a variable ranging over relations; *Rs* is the unique relation satisfying certain empirical conditions. But a final difficulty now arises. For, unless we in some way restrict the domain of relations over which our variable is ranging, the uniqueness claim in question will be generally false. Given one basic relation (or set of basic relations) satisfying the empirical conditions, "[a]ll we have to do is carry out a one-to-one transformation of the set of basic elements into itself and determine as the new basic relations those relation extensions whose inventory is the transformed inventory of the original basic relations. In this case, the new relation extensions have the same structure as the original ones (they are 'isomorphic')" (§154). The difficulty can also be put in another way: assuming that our chosen empirical conditions are themselves logically consistent, the existence claim implicit in our definition of the basic relation(s) will be a logico-mathematical truth and the uniqueness claim will, in general, be a logico-mathematical falsehood.[23]

Carnap responds, then, precisely by restricting the range of our variable: we are not to consider *all* relations—which, as mere mathematical sets of pairs, may be "arbitrary, unconnected pair lists"—but we are to restrict ourselves to "experienceable [erlebbar], 'natural' relations" or what Carnap calls "*founded*" relations (§154). Carnap next makes the extraordinary suggestion that this notion of *foundedness* may itself be considered a basic concept of logic (§154), and he completes the "elimination of the basic relation" thus: *Rs* is the unique *founded* relation satisfying the chosen empirical conditions (§155)! The fundamental aim of construction theory has now—and only now—been reached: all concepts of science have been characterized through purely structural definite descriptions.

It is clear that, in the context of the basic motivations of the *Aufbau*, Carnap's suggested solution to the difficulty can in no way be satisfactory. We are motivated to pursue a program of complete formalization by a conception of scientific objectivity that seeks to

disengage objective meaning entirely from ostension. We now find that to reach our goal we need to introduce the class of *founded* relations as a primitive notion of logic, where the *founded* relations are just the "experienceable, 'natural' relations." But what can the "experienceable, 'natural' relations" be except precisely those relations somehow available for ostension? Our original motivations, in other words, have been totally undermined by Carnap's final move. It is also clear, however, that the difficulty is an extremely fundamental one. If we succeed in disengaging objective meaning and knowledge from ostension and lodge them instead in logical form or structure, then we run the risk of divorcing objective meaning and knowledge from any relation to experience or the empirical world at all. We run the risk, that is, of erasing completely the distinction between empirical knowledge and logico-mathematical knowledge. (In these terms, Carnap's suggestion for introducing the notion of *foundedness* may be seen as an attempt to evade the problem simply by counting *empirical* or *non-logical* as itself a basic concept of logic.)

The importance and significance of this problem can perhaps best be brought out by seeing how it arises for other thinkers of the period.[24] Moritz Schlick provides a particularly clear example. In *General Theory of Knowledge*, as briefly noted above, we are also presented with a formalistic or holistic conception of objective meaning. Precise and rigorous meanings cannot be based on images or sense-data, for these are both fleeting and irreducibly particular—no truly general representation can arise from a sensory presentation. Schlick concludes that objective meaning can have no dependence whatsoever on intuition, and it must be given instead by implicit definitions that completely characterize a concept solely in virtue of its logical relationships to all other concepts. Yet Schlick also immediately observes that a serious problem then arises, for implicit definitions establish no connection between thought and experience at all:

> in implicit definition we have found a tool that makes possible completely determinate concepts and therefore rigorously exact thought. However, we require for this purpose a radical separation between concepts and intuition, thought and reality. To be sure, we place the two spheres one upon the other, but they appear to be absolutely unconnected, the bridges between them are demolished.[25]

Indeed, as Schlick also observes, implicit definitions require only the logico-mathematical consistency of the system of judgements in question, so that empirical truth has so far been subject to no further constraints beyond those of logico-mathematical truth. We are faced, in other words, with the clear possibility of a collapse into

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Schlick struggles with this problem throughout his philosophical career, but never achieves a coherent solution. In the late 1920's and early 1930's, during the heyday of the Vienna Circle, he articulates a classically empiricist (or "atomistic") position according to which all empirical meaning is based on ostensive definitions after all; and this, in fact, is how he arrives at the Verifiability Theory of Meaning. This move certainly succeeds in distinguishing empirical propositions from logico-mathematical propositions, yet it is also totally at variance with our earlier insight that all *objective* meaning must rest in the end on logical form or structure. Schlick acknowledges the resulting conflict in "Form and Content" (1932), but is again unable to find a coherent resolution.[26] His struggles with the form/content distinction are nonetheless of the utmost importance in clearly exhibiting the intellectual temptations that actually give rise to the Verifiability Theory of Meaning, temptations that are so strong that even Carnap momentarily succumbs to them in 1928.[27] Fortunately, however, Carnap's rigorous method of thought immediately suggests a much more fundamental approach to the problem.

In order to understand fully the path Carnap ultimately takes, it is useful to take a preliminary brief look at Wittgenstein's *Tractatus* (1922). The *Tractatus* presents a view that has close affinities with the holistic and formalistic conception of meaning we have been considering: the sense of a proposition is identified with its "place" in "logical space" (3.4-3.42). Moreover, we also find an idea that appears to be very close indeed to Carnap's strategy of finding purely structural definite descriptions for all concepts:

> We can describe the world completely by means of fully generalized propositions, that is, without first correlating any name with a particular object.
>
> Then, in order to arrive at the customary mode of expression, we simply need to add, after an expression like 'There is one and only one x such that . . .', the words: 'and that x is a.' (5.526)

Finally, the discussion of causality and mechanics at 6.3-6.3751 even suggests a justification for this kind of strategy that is also close to Carnap's: the possibility of purely structural definite descriptions rests on sufficient *de facto* asymmetries in the phenomena; therefore, we may presuppose that the laws of nature—in so far as nature is thinkable—will display such formal asymmetries.[28]

Now it would of course be extremely rash confidently to ascribe an *Aufbau*-style program to the *Tractatus*. Yet it is essential, in any case, to see that Carnap's problem of SS153-155 cannot arise in the *Tractatus*. The problem was that the purely structural definite

description Carnap introduces to eliminate the basic relation threatens to turn into either a logico-mathematical truth or a logico-mathematical falsehood—depending on whether we focus on the existence claim or the uniqueness claim implicit in that definition. But this in turn depends crucially on what exactly we mean by "logico-mathematical truth." In particular, it is only if our underlying logic contains a sufficient amount of what we now call set theory—the power set axiom and the axiom of infinity, for example—that the problem arises, for the problem depends precisely on our ability to prove the existence of "too many" relations. Carnap is apparently willing to count virtually all of set theory as logical, and this is why the problem arises for him.[29]

The *Tractatus*, on the other hand, emphatically rejects set theory (6.031) and instead articulates an extremely restricted conception of logico-mathematical truth apparently limited to something in the vicinity of primitive recursive arithmetic (6.2-6.241).[30] On this conception Carnap's problem will then not arise, for neither the existence claim nor the uniqueness claim implicit in the definition of the basic relation will be a logico-mathematical truth (falsehood). If true at all, such claims can only be empirical—that is, non-logical—truths. Hence, if we were to adopt a *Tractarian* conception of logic and mathematics, Carnap's strategy of complete formalization could perhaps be successfully carried out after all. But we would have of course paid a terrible price for this success: the total emasculation of classical mathematics.

The final chapter to our story is written in Carnap's next great work, *The Logical Syntax of Language* (1934)[31]—which, more than any other of Carnap's works, is written under the explicit influence of Wittgenstein's *Tractatus*. In particular, *Logical Syntax* also gives pride of place to the "*combinatorial analysis*. . . of finite, discrete, serial structures" (S2), that is, to primitive recursive arithmetic. Yet Carnap radically transforms this conception by distinguishing—as Wittgenstein never would—between object-language and meta-language.[32] Thus, logic in the sense just defined is understood as *logical syntax*, a neutral meta-discipline within which we can formulate and investigate the formal rules of any and all object-languages or linguistic frameworks. The point is that, although the meta-discipline of logical syntax has itself a very restricted (and therefore uncontroversial) logical structure, we can nonetheless use it to study the logical structures of much richer (and more controversial) object-languages: in particular, the language of classical mathematics and mathematical physics. We hope thereby to avoid the emasculating effects of the *Tractatus*.

Logical Syntax also follows the *Aufbau* in articulating a formalistic

and holistic conception of objective meaning. Objective meaning is entirely determined by the purely formal—purely syntactical—rules of a given language or linguistic framework, and there is absolutely no question remaining concerning "content" or "interpretation" (§62). In other words, the objective meaning of an expression is a function solely of its purely formal behavior in the context of a single language, where "formal" now means "syntactical." How, then, do we avoid the problem of §§153-155 of the *Aufbau*? How do we distinguish empirical truth from logico-mathematical truth? It is true that the meanings of all expressions—both logico-mathematical expressions such as the primitive signs of logic and arithmetic and empirical expressions such as the primitive signs of physics—depend entirely on their purely formal or syntactic behavior. Yet we can still make a distinction (for any given language) *on purely formal or syntactical grounds* between *logical* expressions and *descriptive* (empirical) expressions (§50) and, accordingly, between *analytic* truths such as the axioms of logic and arithmetic and *synthetic* truths such as the laws of physics (§§51-52). In this way, by making the crucial move into the meta-discipline of logical syntax, Carnap has finally reached a position where he can hope coherently to implement all the elements of his underlying philosophical vision: a rigorous version of a purely formal or structural conception of objective meaning and knowledge together with a rigorous, and also purely formal, distinction between logical and empirical truth. Unfortunately, even this position, too, proves to be fundamentally unstable; but that is a different story.[33]

IV

Our discussion has, I hope, raised significant problems for a straightforwardly phenomenalistic reading of the *Aufbau*. The primary aim of construction theory is not the articulation and defense of phenomenalistic reductionism; the primary problem for construction theory does not arise from the failure of phenomenalistic reductionism. What, then, is the real role of phenomenalism—and, more generally, of empiricism—in the *Aufbau*? How, in particular, does it function in the criticism of metaphysics?

First of all, there is no doubt at all that the *Aufbau* does defend empiricism and phenomenalism. Carnap calls the latter doctrine "subjective idealism" and clearly asserts that "[c]onstruction theory and *subjective idealism* agree with one another that statements about objects of cognition can, in principle, all be transformed into statements about structural properties of the given" (§177). Moreover, if the choice is between "rationalism" and "empiricism", Carnap's preference is also perfectly clear:

> Since, according to construction theory, each statement of science is at bottom a statement about relations that hold between elementary experiences, it follows that each substantive (i.e., not purely formal) insight goes back to experience. Thus, the designation "empiricism" is more justified. (§183)

Finally, Carnap even articulates a version of what will later become the Verifiability Principle:

> From a logical point of view, however, statements which are made about an object become statements in the strictest scientific sense only after the object has been constructed, beginning from the basic objects. For, only the construction formula of the object—as a rule of translation of statements about it into statements about the basic objects, namely, about relations between elementary experiences—gives a verifiable meaning [verifizierbar Sinn] to such statements, for verification means testing on the basis of experiences. (§179)

Indeed, since according to Carnap the number of elementary experiences is finite, each scientific statement can in principle be decided on the basis of experience in a finite number of steps (§180)!

Yet it is equally clear, I think, that these empiricist doctrines do not play an essential role in Carnap's criticisms of traditional metaphysics. Carnap addresses such issues in Part V of the *Aufbau*, entitled "Clarification of some philosophical problems on the basis of construction theory." In each case he distinguishes a "constructional" from a "metaphysical" version of the problem and argues that the former can be formulated within construction theory—and therefore within "rational science"—whereas the latter cannot. The discussion of the "problem of reality" (§§170-178) is developed in the most detail and, I think, is most representative of Carnap's attitude.

Section 170 introduces the "constructional" or "empirical" concept of reality—applied, in the first instance, to "physical bodies":

> These bodies are called *real* if they are constructed as classes of physical points which are located on connected bundles of world lines and are placed within the all-comprehending four-dimensional system of the space-time world of physics.

In other words, real physical bodies—unlike objects of dreams, hallucinations, and so on—all fit together determinately in accordance with the laws of physics. Section 171 then extends this idea to all other objects: they too are called real when they fit together determinately with others in a single law-governed system (the system of my psychological states, for example). Thus: "*Every real object belongs to a comprehensive system which is governed by regularities*" (§171).

The "metaphysical" concept of reality—which, according to Car-

nap, is alone at issue in the dispute between "realism, idealism, and phenomenalism"—is characterized as "*independence from the cognizing consciousness*" (§175). Carnap argues in §176 that this concept "*does not belong within (rational) science*" because no notion of "independence from consciousness" suitable to the needs of the dispute "can be constructed." This emphatically does not mean, however, that the notion is "metaphysical" because it cannot be constructed within a phenomenalistic system; rather, according to Carnap, it cannot be constructed within *any* of the systems considered by construction theory:

> It must be noted that this [failure of constructability] holds, not only of a constructional system which has the system form represented in our outline, but for any cognizable [erkenntnismässig] constructional system, even for a system which does not proceed from an autopsychological basis, but from the experiences of all subjects or from the physical. *The* [metaphysical] *concept of reality cannot be constructed in a cognizable constructional system; this characterizes it as a nonrational, metaphysical concept.*[34]

In other words, the "metaphysical" concept of reality lies outside the boundary of science, not simply because it has no experiential or verifiable meaning, but because it has no "constructional" meaning at all: that is, it has no "logical," "rational," "non-intuitive"—i.e., formal—meaning (§182).[35]

Once again, therefore, Carnap's standpoint is much more general than phenomenalism—or even empiricism. Indeed, the "metaphysical" question of reality is ultimately dissolved, for Carnap, not by ruthless application of the Verifiability Principle, but by the fact that construction theory itself captures the meaningful core, as it were, shared by all parties to the dispute. In particular, construction theory agrees with "realism," "idealism," "phenomenalism," and even "transcendental idealism" on all "assertions" (§177); and none of these doctrines has a privileged status. On the contrary,

> *the so-called epistemological schools of realism, idealism and phenomenalism agree within the field of epistemology. Construction theory represents the neutral foundation which they have in common. They diverge only in the field of metaphysics, that is to say (if they are meant to be epistemological schools of thought), only because of a transgression of their proper boundaries.* (§178)

It is metaphysical neutrality rather than radical empiricism that is of the essence of Carnap's position.[36]

Nevertheless, Carnap does, for a time, continue to espouse radical empiricism. Moreover, as briefly noted above, Carnap does of course adopt the Verifiability Theory of Meaning in 1928; and, accordingly,

he does employ the Verifiability Principle to attack traditional metaphysics:

> The view that [metaphysical] sentences and questions are non-cognitive was based on Wittgenstein's principle of verifiability. This principle says first, that the meaning of a sentence is given by the conditions of its verification and, second, that a sentence is meaningful if and only if it is in principle verifiable, that is, if there are possible, not necessarily actual, circumstances which, if they did occur, would definitely establish the truth of the sentence. This principle of verifiability was later replaced by the more liberal principle of confirmability.[37]

And this, of course, is the basis for more straightforwardly empiricist interpretations of Carnap's underlying anti-metaphysical attitude.

Two important factors militate against such interpretations, however. First, as Carnap hints at even here, the Verifiability Principle soon proves to be a clear—and clearly acknowledged—failure; so it can in no way explain or support Carnap's enduring anti-metaphysical position.[38] Second, and more fundamentally, Carnap has available to him throughout his career more powerful and entirely independent criteria for the detection and elimination of "pseudo-questions": namely, the purely logical devices for distinguishing between apparently well-formed statements and genuinely well-formed statements stemming from Russellian type-theory. Such purely logical criteria have nothing whatever to do with radical empiricism or any other epistemological doctrine, and Carnap appeals to them constantly in his criticisms of traditional metaphysics—in the *Aufbau*, in particular.[39] Indeed, in view of the thoroughly type-theoretic character of any constructional system, failure of constructability in general means nothing more nor less than failure to find a definite place in the type-theoretic hierarchy.

In *Logical Syntax* this second, purely logical approach to the problem of eliminating "pseudo-questions" and "pseudo-sentences" becomes clearly predominant and finds its most mature expression. However, in place of the type-theoretic hierarchy, Carnap now emphasizes the closely related distinction between object-language and meta-language.[40] On the one hand, this distinction gives Carnap a clear and precise replacement for traditional metaphysics: that is, a non-empirical discipline—logical syntax—which makes possible a peculiarly philosophical vantage point from which the rest of knowledge may be surveyed:

> Metaphysical philosophy tries to go beyond the empirical scientific questions of a domain of science and to ask questions concerning the nature of the objects of the domain. These questions we hold

> to be pseudo-questions. The non-metaphysical logic of science, also, takes a different point of view from that of empirical science, not, however, because it assumes any metaphysical transcendency, but because it makes the language-forms themselves the objects of a new investigation. On this view, it is only possible to speak either *in* or *about* the sentences of this domain, and thus only object-sentences and syntactical sentences can be stated. (§86)

On the other hand, as the last sentence of this passage suggests, we are also given a clear and precise diagnosis of, and explanation for, the obscurities and confusions of traditional metaphysics: questions concerning the "nature" or "reality" of various entities, for example. Such questions result from attempting to employ what Carnap calls the "material mode of speech," that is, attempting to speak in both the object-language and the meta-language simultaneously, as it were (§§73-81). "Philosophical sentences" in the material mode, according to Carnap, are admissible if, and only if, they are fully translatable into the "formal mode"—that is, into the meta-language of logical syntax—otherwise, they should be rejected as meaningless "pseudo-sentences" (§§78-81).[41]

There is of course no reference to empiricist epistemology or verificationism in any of this. Indeed, in §82 Carnap articulates an extremely liberal and holistic epistemology which explicitly denies that theoretical sentences can be translated into observation sentences ("protocol-sentences") and maintains that no sentence—not even a protocol-sentence—is immune from revision in the progress of science. Yet the underlying anti-metaphysical attitude of Vienna is not compromised in the least:

> The syntactical problems acquire a greater significance by virtue of the anti-metaphysical attitude represented by the Vienna Circle. According to this view, the sentences of metaphysics are pseudo-sentences which on logical analysis are proved to be either empty phrases or phrases which violate the rules of syntax. Of the so-called philosophical problems, the only questions which have any meaning are those of the logic of science. To share this view is to *substitute logical syntax for philosophy*. (§2)[42]

The anti-metaphysical dream of Vienna finally stands or falls, therefore, not with phenomenalism, radical empiricism and the Verifiability Principle, but rather with the remarkable program of *Logical Syntax* itself. And this program, in turn, is best seen as a continuation and development of the earlier, and equally remarkable program of *Der logische Aufbau der Welt.**

NOTES

*This paper is dedicated to the memory of Alberto Coffa, whose pioneering scholarly investigations into the background and development of logical positivism stand as an inspira-

tion to all students of that movement. I myself was just beginning to get to know Professor Coffa, and to discuss these matters with him, when he was suddenly and tragically taken from us. Although I have greatly benefited from his writings, it is certain that if he had lived, his wise advice and penetrating criticisms would have made this paper much less inadequate than it now is.

[1]R. Carnap, [1]: quotations are from the George translation, and references are given in the text by section numbers.

[2]W. Quine [17], p. 39.

[3]W. Quine [18], p. 74.

[4]See [17], pp. 39-40; [18], pp. 76-77.

[5]See the Preface to the Second Edition of [1], p. vi; [5], p. 19.

[6]This of course is how Quine uses the *Aufbau*: [17], pp. 40-42; [18], pp. 77-84. See also H. Putnam [16], pp. 19-20: the significance of Carnap's work is precisely the resulting "proof," as it were, that phenomenalism is false. N. Goodman, on the other hand, in [13], argues against the current anti-phenomenalist consensus; he does appear to agree, however, that it is in connection with the issue of phenomenalism that the *Aufbau* finds its primary significance.

[7]Here also is where technical problems are likely to arise. N. Goodman, in §V.3, §V.5 of [12], raises difficulties for quasi-analysis based on the possibilities of "companionship" and "imperfect community"; and he criticizes Carnap for relying on questionable "extrasystematic assumptions" ruling out such possibilities. I think that these difficulties may not be as serious as Goodman takes them to be; for Carnap himself is quite explicit that his constructions are not fashioned a priori, as it were, but depend on empirical assumptions which may issue in substantial revisions of the system if false (§122). In §V.6, on the other hand, Goodman alludes to another technical problem that does, I think, vitiate the construction: the definition of *quality class* in §112 presupposes that the number of elementary experiences is finite (see also §180, which states this explicitly), whereas the topological notion of *dimension number* employed in §115 presupposes that the number of elementary experiences is infinite (otherwise all "spaces" in question have zero dimension).

[8]In the Preface to the Second Edition of [1], p. vii, Carnap states that he would now prefer to start with sensations or "concrete sense data" after all. This can in no way be taken as a clearer recognition and endorsement of the aims of phenomenalism, however, for in the very next paragraph he states even more emphatically that he would now prefer a *physicalistic* system. It is more likely that purely technical difficulties of the kind mentioned in note 7 above are motivating Carnap here.

[9]In particular, Carnap shows no interest whatever in the philosophical skepticism motivating Russell in chapter III of [20], for example. On the contrary, Carnap's concern with "epistemic primacy" is based on nothing more than the desire to "rationally reconstruct" the actual (empirical) process of cognition (§100). Thus, an important part of his motivation for starting with elementary experiences rather than "atomistic" sensations is based on the purely empirical findings of Gestalt psychology (§67); he is entirely ready to revise his constructions if the "results of the empirical sciences" make this necessary (§122); and so on. (On the other hand, see [5], p. 50: "Under the influence of some philosophers, especially Mach and Russell, I regarded in the *Logischer Aufbau* a phenomenalistic language as the best for a philosophical analysis of knowledge. I believed that the task of philosophy consists in reducing all knowledge to a basis in certainty. Since the most certain knowledge is that of the immediately given, whereas knowledge of material things is derivative and less certain, it seemed that the philosopher must employ a language which uses sense-data as a basis." It is remarkable that there is no trace at all of such concern for philosophical certainty in the *Aufbau* itself, however.)

[10]R. Carnap [5], pp. 16-20.

[11][5], p. 18.

[12]Compare [5], pp. 18-19: "This neutral attitude toward the various forms of language, based on the principle that everyone is free to use the language most suited to his purposes, has remained the same throughout my life. It was formulated as 'principle of tolerance' in *Logical Syntax* and I still hold it today. . . . if one proceeds from the discussion of language forms to that of the corresponding metaphysical theses about the reality or un-reality of some kind of entities, he steps beyond the bounds of science."

[13]See also §66: "Since the stream of experience is different for each person, how can there be even one statement of science which is objective in this sense (i.e., which holds for every individual, even though he starts from his own individual stream of experience)? The solution to this problem lies in the fact that, even though the *material* of the individual streams of experience is completely different, or rather altogether incomparable, since a comparison of two sensations or two feelings of different subjects, so far as their immediately given qualities are concerned is absurd, certain *structural properties* are analogous for all streams of experience. Now, if science is to be objective, then it must restrict itself to statements about such structural properties, and, as we have seen earlier, it can restrict itself to statements about structures, since all objects of knowledge are not content, but form, and since they can be represented as structural entites (see. §15 f.)."

[14]See R. Carnap [4], §46c. See note 7 above, however.

[15]There is now increasing recognition of the Kantian and neo-Kantian influences on positivist thought: see A. Coffa [6], chapters 11 and 12, for example.

[16]Note that Carnap's project for characterizing concepts purely formally or structurally only begins to make sense in the context of polyadic logic or the modern theory of relations: in traditional monadic or syllogistic logic concepts have only a single formal property, namely cardinality. For an attempt to articulate the significance of the distinction between monadic and polyadic logic for Kant's conception of geometry and pure intuition, see M. Friedman [9].

[17]For a somewhat different reading of Carnap's holistic approach to meaning in the *Aufbau* see [6] chapter 13 §3; chapter 14, §2.

[18]M. Schlick [22], [23]: see M. Friedman [8] for a discussion of Schlick on this point.

[19]B. Russell]21]: see also W. Demopoulos and M. Friedman [7].

[20]See especially chapters III-V of C. Lewis [15]—for example, pp. 120-121: "That there is direct apprehension of the immediate, it would be absurd to deny; but confusion is likely to arise if we call it 'knowledge.' There are no 'simple qualities' which are named by any name; there is no concept the denotation of which does not extend beyond the immediately given, and beyond what *could be* immediately given. And without concepts, there is no knowledge."

[21]D. Hilbert [14]. Schlick endorses Hilbert's implicit definitions in §7 of [22]; Lewis expounds a "relational" conception of meaning that is clearly indebted to Hilbert in chapter III of [15]; Russell defends implicit definitions using an example derived from Eddington on pp. 136-137 of [21]; Carnap endorses Hilbertian implicit definitions (and refers to Schlick) in §15.

[22]Compare §155: Carnap himself uses a closely related fact concerning the three dimensionality of the color solid, which is introduced as an "empirical theorem" in §§118-119.

[23]As my colleagues Anil Gupta and Mark Wilson have emphasized to me, this assertion depends on assumptions about the structure of the underlying type-theoretic system with which Carnap is operating. I assume, in particular, that there are an infinite number of individuals of lowest type (axiom of infinity) and that we are working either in the simple theory of types or in the ramified theory *with* the axiom of reducibility. Although Carnap is very casual about the exact structure of his underlying type-theoretic system here, he does claim to capture all of classical mathematics (§107) including n-dimensional real-number space (§125); the above two assumptions are therefore entirely reasonable. (In addition, Gupta has reminded me that there are relations—such as the identity relation, for example—which are explicitly definable in our underlying type-theoretic system. For such relations, both the existence claim and the uniqueness claim are logical truths.)

[24]A problem exactly parallel to Carnap's problem of §§153-155 arises for Russell's notion of "purely structural knowledge" in [21], and it is explicitly raised, in fact, by the mathematician M. Newman: see [7] for details.

[25][22], §7: my translation. Note that what has been "demolished" here is precisely Kant's pure intuition. For Kant, pure spatio-temporal intuition is simultaneously a vehicle for precise mathematical reasoning and a "form" within which we experience nature through the senses. For Kant, then, there is a *necessary* connection between rigorous mathematical reasoning and experience. Hilbert's axiomatization of geometry—along with other nineteenth century foundational developments—then frees mathematical reasoning from any connection whatever with spatio-temporal intuition; unfortunately, however, the necessary relation to our experience of nature has been entirely dissolved as well. This, in the end, is the

source of our problems here. (Again, for the beginnings of an attempt to explore the philosophical significance of these matters, see [9].)

[26]M. Schlick [24]; see also [8] for further discussion.

[27]R. Carnap [2]. For an accurate representation of the role of *Pseudoproblems* in Carnap's thought, see [5]: in §I, "The Development of my Thinking," it is not mentioned at all; it receives only a single brief mention on p. 46 of §II, "Philosophical Problems."

[28]See L. Wittgenstein [25], 6.36-6.3611—especially 6.3611: "when people say that neither of two events (which exclude one another) can occur, because there is nothing to cause the one to occur rather than the other, it is really a matter of our being unable to describe *one* of the two events unless there is some sort of asymmetry to be found. And *if* such an asymmetry *is* to be found, we can regard it as the *cause* of the occurrence of the one and the non-occurrence of the other." Compare §§12-16 of the *Aufbau*.

[29]See note 23 above.

[30]Speaking of logico-mathematical truth in the context of the *Tractatus* is actually rather misleading, for Wittgenstein shows no interest whatever in a logicist reduction of mathematics to logic. His conception of logic can perhaps be approximated by ramified type-theory (3.331-3.334, 4.1273) *without* the axioms of infinity (5.535) and reducibility (6.1232; 6.1233). His conception of mathematics, on the other hand, appears to be a purely combinatorial one limited to some subsystem of primitive recursive arithmetic (6.2-6.241).

[31]R. Carnap [3]: quotations are from the Smeaton translation, and references are given in the text by section numbers.

[32]For the logical problems involved in articulating this distinction, see W. Goldfarb [11]; for Wittgenstein in particular, see also T. Ricketts [19].

[33]See M. Friedman [10] for further discussion.

[34]In what appears to be a rare slip, George translates "erkenntnismässig" as "experiential" here (and a similar problem occurs in §182). Since §59, for example, uses "erlebnismässig" for *experiential*, and since Carnap's point here is that a constructional system need *not* have an experiential basis, something like "cognizable" or "suitable for the representation of cognitions" seems much more appropriate. There is a serious problem of what "erkenntnismässig" actually excludes, of course; but it will not do, I think, to take it to mean *translatability into a phenomenalistic system*, say. For Carnap uses conformity to law as the "constructional" criterion of reality (§§170-171) and holds that a *physicalistic* system is most suitable for representing conformity to law (§59).

[35]Section 182 refers to Schlick [23], where "rational," "formal" knowledge is explicitly contrasted with "intuitive metaphysics." (In reference to the question of translation raised in note 34 above, one should note that Schlick also explicitly opposes "erkennen" and "erleben".)

[36]Section 178 approvingly quotes Gatschenberger: "All philosophers are correct, but they express themselves with varying degrees of ineptness, and they cannot help this, since they use the *available* language and consequently speak in a hundred sublanguages, instead of inventing one pasigraphy." Carnap concludes: "This neutral language is the goal of construction theory."

[37][5], p. 45.

[38]See, for example, Carnap's charming account of a conversation with Einstein on this matter in [5], p. 38.

[39]See [5], p. 45 and §§30-31, §180 of the *Aufbau*. See also [5], p. 25: "Another influential idea of Wittgenstein's was the insight that many philosophical sentences, especially in traditional metaphysics, are pseudosentences, devoid of cognitive content. I found Wittgenstein's view on this point close to the one I had previously developed under the influence of anti-metaphysical scientists and philosophers. I had recognized that many of these sentences and questions originate in a misuse of language and a violation of logic. Under the influence of Wittgenstein, this conception was strengthened and became more definite and more radical." Note that neither radical empiricism nor the Verifiability Principle is explicitly mentioned here.

[40]See [6], chapters 17-18 for an illuminating account of how Carnap's Russellian type-theoretic conception of logic becomes gradually transformed—largely under the influence of Tarski and Gödel—into a modern "Hilbertian" conception based on the distinction between object-language and meta-language.

[41]See also §75: "by this means [the diagnosis of the material mode of speech] the

whole character of philosophical problems will become clearer to us. The obscurity with regard to this character is due chiefly to the deception and self-deception induced by the application of the material mode of speech. The disguise of the material mode of speech conceals the fact that the so-called problems of philosohical foundations are nothing more than questions of the logic of science concerning the sentences and sentential connections of the language of science, and also the further fact that the questions of the logic of science are formal—that is to say, syntactical—questions."

[42]Graciela De Pierris has emphasized to me that Carnap provides a *disjunctive* diagnosis for the sentences of metaphysics here: they are *either* "empty phrases" *or* "phrases which violate the rules of syntax." And, whereas the second disjunct clearly accords with the present interpretation, the first could perhaps be construed as resting on verificationism after all: "empty phrases" are just those devoid of "cognitive content"—that is, unverifiable sentences. The question entirely depends, however, on what exactly Carnap means by "empty [of content]" here. According to the official definition of "content" in *Logical Syntax* (§49), being empty of content or having the "null content" is equivalent to *validity*, which, for Carnap's two official mathematical languages, is equivalent to *analyticity*. What Carnap may be saying here, then, is simply that philosophical sentences are sentences in the material mode ("pseudo-object sentences") which either can be translated into the formal mode ("syntactical sentences") or cannot be so translated. In the former case they are analytic or "empty"; in the latter case they "violate the rules of syntax."

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