Part I

LOGICAL EMPIRICISM

How not to Russell Carnap's *Aufbau*[1]

Alan Richardson

University of Minnesota

Rudolf Carnap is principally renowned for stating with remarkable precision and rigor a rich variety of philosophical doctrines — doctrines which, thanks mainly to Carnap's meticulous formulations, the philosophical world now holds to be clearly and fundamentally mistaken. Thus, it is Carnap who, in *Meaning and Necessity* (Carnap 1947), presents in detail the linguistic doctrine of logical truth and the semantic underpinnings of the analytic/synthetic distinction, providing thereby the grist for the mill of Quine's highly influential and important attacks on precisely these doctrines. Again, it was Carnap who, more than any other, precisely delineated the program of inductive logic. This program is now, thanks largely to Goodman's (1983) New Riddle of Induction, also considered hopeless. Carnap is now firmly associated with a bewildering variety of discredited views: reductionism and the unity of science; the verification criterion of meaning; logic as an uninterpreted calculus; Russellian logicism even in the face of Gödel's devastating incompleteness results; etc.

This view of Carnap as important primarily for his precision and thoroughness in stating and teasing out the consequences of the major dogmas of logical empiricism is put forward especially by Quine and with particular emphasis on Carnap's first major work: *Der logische Aufbau der Welt* (Carnap 1928; Carnap 1969). Indeed the following two quotations from two of Quine's most widely read essays form the basis of the received view of the *Aufbau* common to most contemporary philosophers:

> 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*.

> The language which Carnap adopted as his starting point was not a sense-datum language in the narrowest conceivable sense, for it included also the notations of logic, up through higher set theory... Carnap's starting point is very parsimonious, however, in its extralogical or sensory part. In a series of constructions in which he exploits the resources of modern logic with much ingenuity, Carnap succeeds in defining a wide array of important additional sensory concepts which, but for his constructions, one would not have dreamed were

definable on so slender a base. He was the first empiricist who, not content with asserting the reducibility of science to terms of immediate experience, took serious steps toward carrying out the reduction. (Quine 1980, p. 39)

To account for the external world as a logical construct of sense data — such, in Russell's terms was the program [Russell's epistemological program of the 1910s — AR]. It was Carnap, in his *Der logische Aufbau der Welt* of 1928, who came nearest to executing it... (Quine 1969, p. 74)

Of course, this phenomenalist and constructivist program in the Aufbau does not succeed. Not only is it impossible to derive the totality of science from sensory experience, scientific discourse cannot even be couched in exclusively observational terms, even with the aid of the logical system of Principia Mathematica. For, as Quine argues in "Two Dogmas", highly theoretical sentences of empirical science do not have sensory import individually. Rather only large portions of theory have empirical consequences and, hence, only large segments of theory can be "translated" into observational terms.[2]

This then is the received view of the *Aufbau*: It was the first systematic attempt to use the resources of modern logic to carry out the reduction of all scientific discourse into the terms of immediate experience. And the principal legacy of the *Aufbau* is that it failed in this reduction — and that it did not merely fail in fact, it failed in principle. That is, the important lesson of the Aufbau is that Carnap so rigorously formulated the empiricist thesis of reducibility and the logical resources available to the empiricist that it became clear that the acknowledged failure of Carnap's attempt at providing a constructional system is symptomatic of the impossibility of the program as a whole.

There is something highly unsatisfactory from an interpretative point of view, however, with this view of Carnap's work generally and the *Aufbau* in particular. Logical empiricism as put forward by Carnap deserves to be considered as more than a sequence of very valuable but ultimately failed attempts to apply modern logical techniques to traditional empiricist doctrines. At its best, logical empiricism was a serious and important attempt to find a place for philosophy in the scientific age — to find the scientifically acceptable kernel of certain traditional philosophical disciplines such as logic and epistemology and scientifically acceptable replacements for other traditional philosophical disciplines such as metaphysics. To be sure, in this attempt the logical empiricists generally and Carnap in particular articulated a variety of philosophical doctrines which have subsequently been shown to be unacceptable. However, concentration on the untenable doctrines proposed by Carnap throughout his career obscures the fundamental themes of his philosophy. The fundamental questions that an interpreter of Carnap's philosophy must seek to answer are questions about what constitutes the core of Carnap's philosophical thinking throughout his career so that, for example, Carnap in "Empiricism, Semantics, and Ontology" can refer the reader to arguments given in "Pseudoproblems of Philosophy" despite the intervening twenty-two years and the fact that Carnap had changed his views on many issues including reductionism, verificationism, syntacticism, and logicism.

Consistent with this interpretive point of view I will argue that the idea that the *Aufbau* consists of a rigorous thinking through of a traditional empiricist program in epistemology simply does not hold up under scrutiny. Consider the Quinean conception of the *Aufbau* and its importance canvassed above: The *Aufbau* is notable for making precise the traditional phenomenalist program of empiricism and is most important for failing in principle to fulfill the criteria of that program. There are several aspects of the structure of the *Aufbau* which indicate that, while Quine has located

some of the central aspects of the program, he has missed the aspects which are most interesting, most general, and most prototypically Carnapian about the *Aufbau*. As we examine these aspects of the work we will see an increasing divergence between the *Aufbau* and traditional empiricist thought, while Kantian aspects of the work will come into ever greater focus.[3] The business of this paper will consist in pointing to divergences between Carnap's *Aufbau* and Russell's External World Program.

1. Russell's External World

Early in the second decade of this century, Bertrand Russell turned his attentions away from the purely logical work that had occupied him from roughly the turn of the century through the writing of *Principia Mathematica* and toward epistemological issues.[4] His epistemology was, not surprisingly, greatly influenced by his earlier logical work, however. For the purposes of our comparison of the *Aufbau* with Russell's External World program, we shall focus on three aspects of Russell's general point of view in epistemology: first, the importance of logic and logicism for philosophy; second, the role of the theory of descriptions and the distinction between knowledge by acquaintance and knowledge by description; third, the status of the things known by acquaintance and the verifiability of physics.

Russell is, of course, chiefly renowned in analytic philosophy for his work in logic and in particular the reduction of mathematics to logic. Logicism was extremely important to Russell in his flight from the idealism of his youth and from Kantian philosophy in general. Logicism with respect to mathematics denied Kant his most plausible case of synthetic a priori knowledge: the knowledge of mathematics and geometry. If such knowledge could be founded on logic alone, there would be no need for Kantian pure intuition with space and time as its forms. And hence the whole of transcendental idealism would be shaken.

Logicism was based on a wholly new conception of logic which Russell developed by building on the basis provided to him by Frege and Peano. This logic with its function/argument structure, its acceptance of relations and relational propositions not reducible to subject/predicate form, and its reliance on variables and the generality they confer on judgement allowed logicians for the first time to have a significant field of study. For the first time the logician had an understanding of logic that made possible an infinity of propositional structures, as opposed to mere subject/predicate structure. By the time Russell's attention had turned to epistemological issues his conception of logic had settled on the ramified type theoretical hierarchy of propositional functions found in *Principia Mathematica*.

For Russell there were two distinct parts of logic: the formal and the philosophical.[5] The formal consisted of the kind of material which formed the content of *Principia Mathematica*: proofs, definitions, etc. In the sense of formal logic, the truths of logic consisted of the most general truths; the logical truths contained only logical constants and bound variables. Formal logic, therefore, lacked a subject matter of its own; its laws were the most general laws about everything. The philosophical part of logic, on the other hand, did have a subject matter, namely, propositions and their (formal) logical forms. Logic in this sense forms the subject matter of the Introduction to *PM*, the whole first part of Russell's first book on logic, *The Principles of Mathematics* (Russell 1903), "On Denoting" (Russell 1973), and other such works. Both of these parts of logic provide crucial elements to Russell's thinking on the nature of philosophy.

Formal logic, of course, provides the content of the claims of logicism. *PM* is devoted to the actual derivation of classical mathematics from the formal logic newly

6

invented by Frege and Russell. Hence, formal logic enables us to go beyond Kant. But it also does more than this. For Russell the analytic maneuvers he engages in in his attempt to reduce mathematics to logic provide tools for the philosopher whatever area he may be working in. The methods of definition and the patterns of proof exhibited in formal logic precisely because of their absolute generality provide templates usable for various philosophical endeavors where reduction of one realm of objects and facts about those objects to another realm is deemed desirable.

If formal logic provides the philosopher with tools for analysis, philosophical logic provides the philosopher with an entirely new way of conceiving the business of philosophy. The philosopher is to provide an account of the logical form of propositions found in traditional philosophy or the special sciences. Thus, a philosopher might concern herself with the logical form of propositions about space and time or of propositions involving the notion of judgement. Philosophical logic provides a complete inventory of the possible logical forms of propositions and the philosopher then analyzes propositions of some particular field to find which of those forms such propositions have. The view of philosophers analyzing logical forms leads to the view of philosophy as composed of various and distinct problems and leads Russell to advocate a scientific philosophy (Russell 1981b, p. 85):

> By concentrating attention upon the investigation of logical forms, it becomes possible at last for philosophy to deal with its problems piecemeal, and to obtain, as the sciences do, such partial and probably not wholly correct results as subsequent investigation can utilize even while it supplements and improves them... A scientific philosophy such as I wish to recommend will be piecemeal and tentative like the other sciences...

Only thus will philosophy progress in the way that other sciences do. The propositions of philosophy do not, however, on Russell's conception become just like the propositions of the special sciences; rather they remain a priori and depend only on logic considered as the totality of knowledge about the possible forms of propositions and of facts. Thus, the philosophical propositions depend, indeed form a part of, what has been dubbed Russell's "metaphysics of facts"; "philosophy, if what has been said is correct, becomes indistinguishable from logic" (Russell 1981b, p. 84).

We shall not detain ourselves unduly with an elaboration of the metaphysics, or logic, of facts that Russell subscribed to in the 1910's, but we must discuss the importance of the theory of descriptions. The theory of descriptions was Russell's mature response to what he termed the problem of denoting within his understanding of logic. The problem of denoting first arose for Russell in his 1903 book *The Principles of Mathematics*. In that work Russell put forward a view of propositions in which a proposition is a complex of constituents and those constituents are typically what the proposition is about. Thus the proposition "Heloise loves Abelard"[6] is a structured entity consisting of Heloise, the relation of loving, and Abelard. However, certain propositions obviously contain constituents which they are not about, viz. "Every man is mortal". This proposition contains the constituent "every man" but is not about this constituent, which after all is a concept and hence not mortal. Thus Russell is lead in 1903 to consider what we now recognize as quantified phrases to be denoting concepts that occur in propositions which are, however, not about those complexes but about the objects denoted by the complexes, objects that do not occur in the proposition at all.

Implicit in Russell's 1903 theory of denoting is the idea that the surface grammatical structure of a sentence provides a good guide to the underlying logical constituent structure of the proposition. Russell became suspicious of this idea by 1905 when he

wrote his seminal paper "On Denoting". In this paper Russell proposes that denoting phrases are not associated with denoting complexes in the underlying propositions but rather that in the propositions there is no constituent at all that corresponds to the denoting phrase. Thus on the 1905 account there is no relation of denoting in anything like the sense that notion had in 1903. The 1905 theory replaces the theory of denoting with the analysis of descriptions in terms of quantifiers and identity which has become standard in logic since *PM*. Thus the idea that there is an important analytic function in logic and philosophy, distinct from reading off the logical form of propositions from the surface grammar of sentences comes to the fore in the theory of descriptions.

We saw that the 1903 theory of denoting was in response to a metaphysical (or logical) question about how certain propositions can be about objects that are not constituents of those propositions and can contain objects which are not what the propositions are about. In 1905 this concern is altered into an epistemological concern about how we can know anything about objects only known by description. To know something by description is to know a proposition in the verbal expression of which that thing is described by a phrase such as "the so-and-so". To know an object only by description is for all the facts known about an object to be known by description. Russell contrasts knowing something by description with knowing it by acquaintance. When one is acquainted with something (particular, universal, fact) one is presented with it. The question then is how can one acquire knowledge by description of things.

The answer Russell proposes to this question is that (Russell 1973, p. 119) "in every proposition that we can apprehend (i.e. not only in those whose truth or falsehood we can judge of, but in all that we can think about), all the constituents are really entities with which we have immediate acquaintance." This then sets the goal of analysis. A proposition has been fully analyzed when all the constituents of it are entities with which one is acquainted. And this analytic goal is supplemented with the logical machinery of formal logic to provide (Russell 1981c, p. 115) "the supreme maxim of scientific philosophizing...: *Wherever possible, logical constructions are to be substituted for inferred entities.*"

Given the line Russell takes on the apprehendability of propositions, the problem with inferred entities is clear enough. Being inferred and not presented such entities cannot appear in any propositions that we can understand. Hence, the supreme maxim subserves an ontological and analytic fact: entities we are acquainted with are all the entities there are. And to logically construct an entity from those we are acquainted with is to show general rules by which to analyze any proposition that seems to have that entity as a constituent into a proposition in which only entities we are acquainted with occur.

Of course, we are left now with the question of what entities one is acquainted with. Russell (1973, pp. 103f; 1981a, pp. 152ff) takes a broad line on this question. First and foremost, we are acquainted with sense-data, i.e. the particulars acquired in sensibility. But we are also acquainted with logical constants and logical forms. Further, we are also acquainted with certain universals (properties and relations) through experience.

Thus, the analytic enterprise in philosophy reaches for one goal: to reduce all propositions about any subject matter into propositions about things with which we are acquainted. Russell did this for mathematics by reducing it to logic. The same must be done for other fields of enquiry, only in these cases they will typically be reduced to logic and sense-data (in Russell's broad sense of the term). Russell presents

8

his notion of the appropriate question of epistemology at the outset of his essay "The Relation of Sense-data to Physics" (Russell 1981c, p. 108):

> If [the theoretical objects of physics] are to be verified, it must be solely through their relation to sense-data: they must have some kind of correlation with sense-data and must be verifiable through their correlation alone.

But how is this correlation itself ascertained?

And he answers his question by stating (Russell 1981c, p. 108) "We may succeed in actually defining the objects of physics as functions of sense-data." In this way he hopes to succeed in grounding the validity of physics solely in its relation to sense-data and show how high level theoretical claims in physics actually can be understood. Thus the overall empiricist nature of Russell's epistemology is born.

We see then that the nature of the Russellian epistemic program Quine takes Carnap to be following is captured quite well in our opening quotes from Quine. It is indeed crucial to the epistemological program of Russell that all discourse on whatever domain be reducible to talk of that with which we are acquainted and that this is for Russell largely sense-data. Quine takes Carnap to be following the same lines of thought in the *Aufbau*, but also to be making significant improvements over Russell's own attempts at providing a systematic reduction of discourse generally to discourse only involving sense-data. And as is evident from the quotes above, the primary advantage Quine finds in the *Aufbau* as opposed to, say, "The Relation of Sense-data to Physics", is the ingenuity of Carnap's logical manipulations which enable Carnap to proceed from an auto-psychological, i.e solipsistic, basis in his reductions while Russell despaired and only attempted to reduce physical object talk to a language of sensibilia and not sense-data. The crucial distinction here is that Carnap's basis is the sense-data of an individual whereas Russell required not only the sensibilia of all epistemic agents but unsensed sensibilia as well.[7]

2. Carnap's Logical Construction of the World

Quine is certainly correct in maintaining that Carnap wants to establish a constructional system based on an auto-psychological basis — a phenomenalist reduction of all significant scientific discourse to a sense-data language. But the important question is why Carnap makes this attempt. Carnap's various formulations of the point of outlining this phenomenalist system contrast significantly with the points that Quine sees for the project. Carnap writes in the introductory sections of the *Aufbau* (Chapter A) that (§3):

> The present study is an attempt *to apply the theory of relations to the task of analyzing reality*. This is done in order to formulate the logical requirements which must be fulfilled by a constructional system of concepts, to bring into clearer focus the basis of the system, and to demonstrate by actually producing such a system (though part of it is only an outline) that it can be constructed on the indicated basis and within the indicated logical framework.

This passage indicates the most important feature of the work as a whole: the constructional system actually outlined in the *Aufbau* is meant to illustrate the methodological concerns which are its true focus. This can be seen clearly in the fact that Carnap (§57) envisions a plurality of possible constructional systems. The phenomenalist system he constructs in the *Aufbau* stands opposed to constructional systems

with physical bases and heteropsychological bases. This points to significant differences with Russell.

Carnap clearly means for the principal lesson of the *Aufbau* to be an illustration by way of example of the nature and methodology of *construction theory*. Construction theory is Carnap's new scientifically and logically acceptable replacement for metaphysics (including that part of metaphysics which has infected traditional epistemology). Thus, the presentation of the phenomenalist constructional system is meant to illustrate the power of a more general method of conceptual analysis embodied in construction theory.

Now construction theory has as its aim the formation of constructional systems on the basis of the logical system of (the second edition of) *PM* and certain empirical facts of the matter from whatever sciences as may be pertinent to the investigation. Carnap's best description of what he means by constructional system is given on his 1927 paper "Eigentliche und uneigentliche Begriffe" where he writes (Carnap 1927, pp. 355-6):

> The concepts of any domain, be it geometry or economics, allow themselves to be so ordered that certain concepts are placed undefined at the beginning and the remaining concepts are defined with the help of these "*basic concepts*"... Such a *derivation* occurs through an *explicit definition*, i.e. through establishing that a certain new concept word is to be synonymous with an expression that consists of old words, i.e. of such as have already been defined or which designate the basic concepts. If such a derivation for a concept is given, we say of it that it is "*constructed*" on the basis of the basic concepts of the domain. In this way the concepts of any domain allow themselves to be ordered in a "constructional system".

Thus, a constructional system for a domain is a system of basic concepts for that domain and explicit definitions of the other concepts in the domain on this basis. It is, in other words, a system of concepts for that domain that provides for it a conceptual structure like the structure of mathematical concepts provided by Russell in his *PM* definitions of mathematical terms on the basis of logical terms.[8]

The phenomenalist constructional system that Carnap outlines in the *Aufbau* is, then, of secondary importance in the work; it is meant to show how construction theory provides the tools for a new analytic approach to philosophy. Furthermore, such a phenomenalist system is not the only constructional system adequate for the construction of all the concepts of science. The status of physics as the most general science of physical objects and the rejection of mind/body dualism lead Carnap to contend that a constructional system with a physical basis is possible. Thus the philosophical point of view that Carnap is espousing is as consistent with physicalism as it is with phenomenalism.

This idea that Carnap's philosophical point of view is consistent with a variety of seemingly inconsistent philosophical schools is, I would argue, the most characteristic feature of the *Aufbau* and shows the continuity of the *Aufbau* to Carnap's later philosophy. The phenomenalist constructional system actually outlined in the work is certainly consistent with traditional empiricist goals in epistemology. Indeed, in §3, Carnap places the work within the tradition of Mach, Avenarius, and Poincaré — work towards reducing "reality" to the "given". This aspect of the *Aufbau* has been overemphasized, however, by Quine and Goodman. For it is clear from the final, more philosophical sections (Chapter E) of the *Aufbau* that Carnap intends that his

work be consistent with the truly epistemological portions of all the traditional schools of philosophy. The following statement (from §178) is, I believe, the crucial philosophical point that Carnap was hoping to establish in the *Aufbau* and the one by which much of the work he did throughout his career was motivated:

> [T]he 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.

It is clear from this statement that Carnap was not intending the *Aufbau* to vindicate one of the traditional approaches to epistemological issues as opposed to any of the others. What he intended for construction theory was a metaphysically neutral, scientifically acceptable, and methodologically sound *replacement* for the traditional metaphysical enterprise, one that has significant importance for traditional epistemology via the possibility of a constructional system with an autopsychological basis.

We see here how far we have gone from a Russellian conception of philosophy. Russell's maxim on analysis that no proposition is comprehensible unless reducible to terms with which we have acquaintance builds epistemic concerns into the foundation of analysis. A constructional system with a physical basis would not even count as an analysis or construction of the world for Russell, for we are not acquainted with the fundamental objects of physics. Logicism with respect to mathematics has a point for Russell because we are acquainted with the fundamental concepts of logic and with the help of the definitions of *PM* we can translate mathematics into terms of these concepts; similarly analysis of empirical propositions only makes sense if we reduce them into concepts and particulars we are empirically acquainted with.

This points to a divergence between Russell's and Carnap's understanding of the status of logic. For Russell, philosophical analysis will give a characterization of the entities that appear at level one of the type hierarchy; these will be the particulars we are acquainted with. Russell's conception of logic as providing the most general laws of these objects does not allow any sense to be made of the idea that we can simply choose those objects that appear at level one and then apply the formal logical results of type theory to these chosen objects. This sense of application — implicit in Carnap's term "applied theory of relations" and necessary on the idea of more than one basis for the construction of the objects of science — is totally foreign to Russell.

Why then does Carnap choose to outline the autopsychological system and not the physical system? Because the task he sets for himself in the *Aufbau* is not the rational reconstruction of science, rather it is the rational reconstruction of epistemology. Carnap (§54) is attempting to order objects within a constructional system which captures their relative epistemic priority. Further, Carnap takes it as a matter of empirical fact that all access to the external world is mediated by the senses. In a real sense, the physicalist basis would have provided a more natural basis for the construction of the world — the construction of science — Carnap is, however, constructing our knowledge of the world. Or, to speak more with Carnap, providing a rational reconstruction of science lends itself to a physicalist basis whereas rationally reconstructing epistemology suggests an autopsychological basis. Indeed Carnap at one point thought of writing a second book with a physicalist constructional system with the title eventually given to the *Aufbau* or, alternatively, *Wirklichkeitslogik* (*Logic of Reality*), and was considering *Erkenntnislogik* (*Logic of Knowledge*) for the *Aufbau*.[9]

Carnap's interest in the *Aufbau* in presenting the epistemically based system is motivated by two considerations, I believe. First, Carnap intends to be providing a new view of the philosophical enterprise in the *Aufbau* and it is necessary for him to show his philosophical audience that this new view has important consequences for areas that they would consider to be of philosophical import. Epistemology is clearly such an area. Second, although someone of a different epistemic point of view may seriously question the phenomenalist basis of Carnap's system, the idea that within an epistemically oriented system all concepts must and will find a place is common to all epistemological schools. That is, Carnap divides the rational and the metaphysical in accordance with the constructible versus the nonconstructible in Part V (§179). It is common to all epistemological schools that any concept not constructible from the fundamental epistemic concepts is irrational — is a concept we could know nothing of. This necessary completeness of epistemic systems makes certain of the criticisms of Part V more compelling than, say, a physicalist system would have. For, within traditional metaphysics, the idea that all concepts are constructible from a physical basis is controversial and hence criticisms of irrationality based on failure of contractibility would carry less force.[10]

This indicates the subservience of the particular constructional system developed by Carnap to the general program of construction theory. Only because we are interested in the *Aufbau* in construction theory's transformation of traditional epistemology and the light that transformation sheds on traditionally epistemic issues has Carnap chosen to develop the particular scheme that he has. For construction theory provides more than just the "neutral foundation" of epistemology, it provides the neutral foundation within which any question of the legitimacy of any concept can be couched.[11] Epistemology is transformed by the overthrow of traditional metaphysics certainly but so are many other disciplines.

While the particular constructional system chosen by Carnap in the *Aufbau* is well in keeping with the traditional goals of empiricism, the goal of construction theory and, hence, even the way that Carnap wants to use the phenomenalist system he outlines is not. For the goal of construction theory is to provide an objective meaning for the concepts of science by placing those concepts in a definite place in a definitional hierarchy (§2). And Carnap is at pains to provide within construction theory an understanding of scientific objectivity that abstracts from rather than relies on the subjective contents of individual experience. Thus, Carnap writes (§2):

> Even though the subjective origin of all knowledge lies in the contents of experiences 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 identical for all observers.

The constructions of the *Aufbau* are going to provide entrance into this intersubjective, objective world, not by merely providing each agent with a standard method of constructing the world, but by conforming with the absolutely fundamental and striking account of objectivity Carnap advances in the preliminary sections of the work. Carnap presents the idea in the following way in §16:

> 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.

For Carnap in the *Aufbau* the objective and the objectively communicable are exhausted by the structural properties of the objects of science. An object is an individual for science only if it is possible to give a definite description of it in purely structural terms (§15).

There is every reason to believe that Carnap was unsuccessful in the *Aufbau* in presenting an account of the objectivity of science in conformity with this structuralism.[12] Two general points can be made at this juncture, however: First, the preliminary sections of the *Aufbau* make it clear that, regardless of the satisfactoriness of the notion of objectivity Carnap endorses, the primary purpose of construction theory is to provide the concepts of science with objective meaning and, thereby, to show how objective science is possible. Second, Carnap's account of objectivity clearly excludes the qualities and relations of any one individual's subjective experience from the domain of objective knowledge (except with the tag that says that this is N's experience (cf. §149)). Thus, no relation such as Russell's acquaintance stands at the foundation of Carnap's epistemology. In the end, it is only certain structural analogies between the elementary experiences of individuals which guarantees the construction of the intersubjective world of science (Part IV, Chapter C).

The over-all program of the *Aufbau* is, therefore, more clearly directed toward Kantian issues and problems than it is toward the issues of traditional empiricism. Carnap wants first and foremost to provide the language and logical tools necessary to secure the objective meanings of scientific terms and, thereby, guarantee of the objectivity of science — and this procedure proceeds more despite than because of the individual agent's knowledge of his own sense data.[13]

Thus, Carnap's avowed aims in the *Aufbau* differ from Russell's External World program and these differences go beyond Carnap's more consistent phenomenalist basis and farther ranging constructions. Carnap's constructional systems in the *Aufbau* are meant to provide the objective meaning of all the concepts of science, but his analyses are not guided by a principle that states that propositions are only comprehensible when they consist of elements with which one is acquainted. Hence, there is no construction theoretic need to require analyses which reduce all concepts to a language of sense-data and logic. Rather this empiricist requirement is only necessary for a constructional system intended to reflect the relation of epistemic priority. And, as we have seen, the precise nature of this requirement takes a quite different form in Carnap than it does in Russell, due to Carnap's account of objectivity.

Notes

[1]This paper has been improved by discussions with Anil Gupta, Thomas Ricketts, and especially Michael Friedman. My thinking on Russell has been influenced by Ricketts' unpublished paper "Facts, Logic, and the Criticism of Metaphysics in the Tractatus". A prior version of this paper was presented to the Fullerton Club at Bryn Mawr University and I would like to thank David Ward for the invitation and the audience for helpful comments.

[2]Of course, Quine (1969, p. 79) notes that it is rather absurd to talk of translation in a case where entire paragraphs of theory can be couched in sensory terms but none of the sentences composing the paragraph can be and proposes that it is more useful to think of the situation not as providing a translation of the theory in sensory terms but as providing the empirical import or evidential basis of the theory.

[3]Friedman (1983, Chapter One; 1987) has emphasized the Kantian origins of logical empiricism. My interpretation of the *Aufbau* has been greatly informed by the interpretation presented in (Friedman, 1987).

[4]We shall see below that Russell's understanding of analysis took an epistemic turn already in 1905, but he did not concern himself with issues of traditional epistemology until (Russell 1912).

[5]See (Russell 1981b, pp. 85f) and (Goldfarb 1989).

[6]In discussing Russell the quotation marks do not form names of linguistic entities (sentences), but rather names of propositions.

[7]Quine's reading finds aid and comfort in Carnap's contrast in §3 between his autopsychological system and Russell's heteropsychological one.

[8]In the *Aufbau*, in contrast to (Carnap 1927), Carnap is interested exclusively in constructional systems for the whole of science as opposed to some special science such as economics. Constructional systems with bases adequate for the construction of all the concepts found in any science provide the foundation for Carnap's avowed aim of unified science (§2) and, hence, are the only constructional systems Carnap considers in the *Aufbau*.

[9]Coffa (1985) gives an interesting account of the history of the title of the Aufbau.

[10]Michael Friedman quite rightly has urged to me that only those who view epistemology as a foundational or reductive discipline would be moved by these considerations.

[11]Cf., e.g., the host of different subjects to which the theory of relations is applied in the second part of Carnap's *Abriss der Logistik* (Carnap 1929): not only set theory, arithmetic, and various problems in physics, but theory of knowledge and the analysis of language.

[12]Friedman (1987) examines this notion of objectivity and the shortcomings in Carnap's attempt to fulfil its requirements in great detail.

[13]Indeed Carnap does not base his system on sense data in the traditional sense at all and, as Friedman (1987) notes, much of the most technically innovative and suggestive material in the *Aufbau* occurs in Carnap's construction of sense qualities from his basis, the recollection of similarity relation.

References

Carnap, R. (1927), "Eigentliche und uneigentliche Begriffe", *Symposion* 1: 355-374.

_____. (1928), *Der logische Aufbau der Welt*. Berlin: Weltkreis.

_____. (1929), *Abriss der Logistik*. Vienna: Springer.

_____. (1947), *Meaning and Necessity*. Chicago: University of Chicago Press.

_ _ _ _ _ _. (1969), *The Logical Structure of the World*. Berkeley: University of California Press. (Translation of Carnap (1928)).

Coffa, A. (1985), "Idealism and the *Aufbau*", in The Heritage of Logical Positivism, N. Rescher (ed.). Lanham, MD: University Press of America, pp. 133-155.

Friedman, M. (1983), *Foundations of Space-Time Theories*. Princeton: Princeton University Press.

_ _ _ _ _ _ _ . (1987), "Carnap's *Aufbau* Reconsidered", Noûs 21: 521-545.

Goldfarb, W. (1989), "Russell's Reasons for Ramification", in *Rereading Russell*, C.W. Savage and C.A. Anderson (eds.). Minneapolis: University of Minnesota Press, pp. 24-40.

Goodman, N. (1983), *Fact, Fiction, and Forecast*. 4th Edition. Cambridge: Harvard University Press.

Quine, W.V. (1969), "Epistemology Naturalized", in *Ontological Relativity and Other Essays*. New York: Columbia University Press, pp. 69-90.

_ _ _ _ _ _ . (1980), "Two Dogmas of Empiricism," in *From a Logical Point of View*. 2nd Edition. Cambridge: Harvard University Press, pp. 20-46.

Russell, B. (1903), *Principles of Mathematics*. Cambridge: Cambridge University Press.

_ _ _ _ _ _. (1912), *Problems of Philosophy*. London: Home University Library.

_ _ _ _ _ _. (1914), *Our Knowledge of the External World*. London: The Open Court.

_ _ _ _ _ _. (1973), "On Denoting", in *Essays in Analysis*, D. Lackey (ed.). New York: George Braziller, pp. 103-119.

_ _ _ _ _ _. (1981a), "Knowledge by Description and Knowledge by Acquaintance", in *Mysticism and Logic*. Totowa, NJ: Barnes and Nobles, pp. 152-167.

_ _ _ _ _ _. (1981b), "On the Scientific Method in Philosophy", in *Mysticism and Logic*. Totowa, NJ: Barnes and Nobles, pp. 75-93.

_ _ _ _ _ _. (1981c), "The Relation of Sense-data to Physics", in *Mysticism and Logic*. Totowa, NJ: Barnes and Nobles, pp. 108-131.

Whitehead, A. and Russell, B. (1910) *Principia Mathematica*. Cambridge: Cambridge University Press.