MICHAEL FRIEDMAN

EPISTEMOLOGY IN THE *AUFBAU* *

In *Der logische Aufbau der Welt* Carnap inaugurates a new philosophical discipline he calls "constitutional theory [*Konstitutionstheorie*]" and presents a particular "constitutional system [*Konstitutionssystem*]" in which "[all] scientific concepts are reduced to the 'given'" (§3).[1] This particular constitutional system proceeds from an "autopsychological basis" in which "the choice of basic elements is limited to such psychological objects that belong to only one subject" (§63). More precisely, the basic elements consist of the conscious psychological objects or "experiences" of a single subject (§64). Constitutional theory also envisions other possible constitutional systems, however: notably, a constitutional system with "general-psychological basis" in which scientific concepts are reduced to the experiences of all subjects (§63), and a constitutional system with "physical basis" in which scientific concepts are reduced to the fundamental concepts of physics (§62). What is common to every such constitutional system, then, is just the circumstance that all scientific concepts are to be defined in a single system on the basis of a few fundamental concepts:

> A constitutional system does not only have the task, like other conceptual systems, of classifying concepts in various types and investigating the differences and mutual relations of these types. Rather, concepts are to be step-wise derived or "constituted" from certain basic concepts, so that a *genealogical tree of concepts* results in which every concept finds its determinate place. That such a derivation of all concepts from a few basic concepts is possible is the main thesis of constitutional theory, through which it is distinguished from most other theories of objects [*Gegenstandstheorien*]. (§1)[2]

The general discipline of constitutional theory therefore has the task of investigating all possible forms of step-wise definitional systems of concepts: all possible reductionist "system forms" (§46, compare §§59, 60).

Among the alternatives to the system form with autopsychological basis Carnap clearly holds that the system form with physical basis is most important. This is because such a physicalistic system form "has that domain (namely the physical) as basic domain which is the only one endowed with an unambiguous [*eindeutig*] law-governedness of

Synthese **93**: 15–57, 1992.

its processes" and therefore "presents the most appropriate order of concepts from the point of view of [empirical] science [*Realwissenschaft*]" (§59). Indeed, Carnap was dissatisfied with the title of the *Aufbau* for precisely this reason, and he at one time envisaged a second work that was to supplement what we now know as the *Aufbau* by presenting the same kind of detailed development of a physicalistic system. This work was to be entitled *Wirklichkeitslogik* or *Der logische Aufbau der Welt*, whereas what we now know as the *Aufbau* was to be entitled *Erkenntnislogik* or *Der logische Aufbau der Erkenntnis*.[3]

Nevertheless, the *Aufbau* itself presents a detailed development of only one constitutional system, the system form with autopsychological basis, and this particular choice of system is motivated entirely by the idea of "epistemic primacy [*erkenntnismäßige Primarität*]":

> The system form that is here to be given to the outline of a constitutional system is characterized by the circumstance that it not only attempts to present the order of objects with respect to their reducibility, like every system form, but that it also attempts to present the order with respect to *epistemic primacy*. An object (or a type of objects) is called "*epistemically primary*" in relation to another – the "*epistemically secondary*" – if the latter is cognized through the mediation of the former, and therefore the cognition of the former is presupposed by the cognition of the latter. (§54)

The "intention to present through this constitutional system not only a logical-constitutional order of objects, but beyond this also their epistemological order" then motivates the choice of a system form with autopsychological basis over one with physical basis (§64, compare §59), and the same considerations motivate the choice of an autopsychological basis over a general-psychological basis (§64, compare §§58, 60). Thus the desire to have the order of logical reduction or definition reflect the order of cognition explains the particular form of constitutional system actually developed in the *Aufbau*, and it is this, moreover, that makes the *Aufbau* a work of epistemology.

What I want to explore here is the point of this "epistemic-logical" constitutional system (§1). What is the epistemological purpose of so reducing or defining all scientific concepts from an autopsychological basis, that is, from the "given"? What kind of epistemological program does the *Aufbau* represent, and in what epistemological tradition is it to be placed?

1.

The answer immediately suggesting itself – especially within contemporary Anglo-American philosophy – is that the *Aufbau* belongs squarely in the tradition of modern epistemological empiricism: the tradition of the classical British empiricists, of Mach,[4] and of Russell's *Our Knowledge of the External World* (1914).[5] The primary epistemological problem addressed by the *Aufbau* is therefore the traditional "problem of the external world": How are we justified on the basis of the immediate data of sense in the belief that there is an external world lying behind or corresponding to the immediate data of sense? How can we infer from such certain and secure data to the apparently much less certain claims of science and common sense? The epistemological point of the *Aufbau* is to develop a traditional phenomenalist or reductionist solution to this problem: the external world does not lie behind or correspond to the immediate data of sense at all; rather, it is nothing but a complex logical construction out of such immediate data. Our claims about the external world are in the end complex claims about the immediate data of sense and hence are thereby justifiable in principle. What then distinguishes the *Aufbau* within the empiricist tradition is simply the greater detail and rigor with which it attempts to carry out this phenomenalist program.[6]

This conception of the epistemological point of the *Aufbau* is certainly a very natural one. Carnap takes as his motto for the book Russell's "supreme maxim in scientific philosophizing": "Whenever possible, logical constructions are to be substituted for inferred entities". References to Mach and especially to Russell are found frequently throughout the text. In his 'Intellectual Autobiography' Carnap explicitly names Russell's *Our Knowledge of the External World* as the central stimulus and inspiration for his writing of the *Aufbau*;[7] and he himself then articulates the above epistemological conception in the most explicit terms:

> 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 of 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.
>
> [The Vienna Circle] assumed that there was a certain rock bottom of knowledge, the

knowledge of the immediately given, which was indubitable. Every other kind of knowledge was supported by this basis and therefore likewise decidable with certainty. This was the picture which I had given in the *Logischer Aufbau*; it was supported by the influence of Mach's doctrine of the sensations as the elements of knowledge, by Russell's logical atomism, and finally by Wittgenstein's thesis that all propositions are truth-functions of the elementary propositions.[8]

It would be difficult indeed to find a clearer statement anywhere of the assumptions and goals of phenomenalistic foundationalism.

Yet when we turn to the text of the *Aufbau* itself such an epistemological conception is hardly in evidence. First of all, Carnap as a matter of fact devotes very little space or energy to the problem of the external world. Most of his effort is rather devoted to a technical elaboration of the procedure of "quasi-analysis" by which specific sensory qualities such as colors are defined from originally undifferentiated momentary cross-sections of the "stream of experience", that is, from "elementary experiences" (§§67–93, 104). This construction, which takes place entirely within the domain of the autopsychological, is then the only part of Carnap's "Outline of a Constitutional System" to be actually presented in complete logical detail (§§108–21). The constitution of physical objects – comprising the "visual things", "my body", the "tactual-visual things", "the perceptual things", the "world of physics", and finally the "biological objects" including "men" – is then presented only briefly and sketchily (§§124–37). The key step in the constitution of the external world is actually presented in a single section, "The ascribing of colors to world-points" (§126): after constructing space-time as a purely mathematical object out of quadruples of real numbers (§125), Carnap embeds the previously defined visual fields (§117) of our subject into this space-time and projects colored points of the visual field onto colored points external to the subject in space in such a way that principles of continuity and constancy are satisfied.

In no domain beyond that of the autopsychological does Carnap make any attempt whatever to present genuine logical definitions of the constituted objects. In particular, he makes no attempt to show that his principles for ascribing colors to world-points can be turned into an explicit definition of the visual things (§128); and this, of course, is why it is now standardly thought that Carnap's "construction of the external world" is a failure.[9] What I want to emphasize here, however, is that Carnap in fact devotes very little attention to this problem and prefers instead to concentrate on other matters: namely, the construc-

tion of the entire domain of the autopsychological from a single primitive relation (remembrance of part-similarity in some arbitrary respect: §78) holding between unanalyzable (§68) elementary experiences. The idea that Carnap is here presenting a more detailed and rigorous solution to the problem of the external world than had Russell is therefore, in this respect at least, seriously at odds with the text.[10]

In the second place, Carnap nowhere employs the traditional epistemological vocabulary of "certainty", "justification", "doubt", and so on, in the *Aufbau*.[11] He nowhere says that knowledge of autopsychological objects is more certain or more secure than knowledge of physical objects, and the distinction between "hard data" and "soft data" central to Russell's motivation for his construction of the external world is entirely foreign to the *Aufbau*. Carnap appeals at all levels of his constitutional system to "the particular results of the [empirical] sciences [*Realwissenschaften*]" in guiding his specific methods of constitution (§122). Indeed, this is particularly true at the autopsychological level, where the choice of unanalyzable elementary experiences as basic elements is based principally on the empirical findings of Gestalt psychology (§67). Carnap's aim, accordingly, is to demonstrate "[t]he *translatability of all scientific assertions into assertions within a constitutional system*" (§122) in such a way that "the actual process of cognition" is "*rationally reconstructed*" (§143, compare §100). In this way, the constitutional system presents a rational reconstruction of the order in which objects of various domains are in fact cognized, but there is no suggestion at all that objects of different levels differ in certainty or security of epistemic value. On the contrary, as parts of a unified presentation of the results of the empirical sciences all objects of the constitutional system necessarily have the same (tentative and empirical) epistemic value.[12]

The order of cognition reflected in the constitutional system is, as noted above, the order of epistemic primacy (§54): lower-level objects are epistemically primary relative to higher-level objects, and this means that "the latter [are] cognized through the mediation of the former, and therefore the cognition of the former is presupposed by the cognition of the latter". Note the blandness and neutrality of this characterization: there is no implication, in particular, of different degrees of certainty or security.[13] A similar blandness characterizes the discussion of the "method of indicators", which actually puts the order of epistemic primacy into effect. Thus an "indicator" of a state of affairs is "such a

[sufficient] condition by which the state of affairs is also customarily cognized, which is therefore usually cognized *before* the state of affairs" (§49). As examples Carnap then gives the barometer as an indicator for air pressure and "x is an animal which carries a number of rattles at the end of its body" as an indicator for "x is a rattlesnake".[14] It is hard to see how any serious work in traditional justificational or foundationalist epistemology can possibly be done here.[15]

Nevertheless, it is instructive to trace out in more detail how Carnap's method of indicators in fact applies to the traditional problem of the external world. As noted above, the crucial step in the constitution of the external world is taken in §126, where Carnap projects colored spots in the subject's (two-dimensional) visual field onto external points in (three-dimensional) space. The indicator of a colored point on the surface of a physical object is therefore a similarly colored spot in my visual field. Does it follow that there is such a colored surface whenever I sense a similarly colored spot in my visual field? Of course not; for the coordination of colored physical points to colored spots in my visual field is further regulated and controlled by principles of continuity and constancy – and then supplemented and corrected by analogy (§135), the general laws of physics (§136), and the reports of other persons (§144). Intuitively, such supplementation and correction may show that the original colored spot in my visual field was an "illusion" and thus proceeded from another "cause" than a real colored surface.

Now such phenomena of "illusion" and "multiple causation" are of course taken traditionally to show that the coordination of physical objects to sense-data is not unique and to argue therefrom to the conclusion that physical objects *cannot* be defined in terms of sense-data. Indeed, Carnap himself presents just such an argument in his earlier paper (Carnap 1924; see note 10 above). His principal claim there is that the two-dimensional "primary world" of immediately given sensations exhibits no "determining laws [*determinierende Gesetze*]" by which processes are "unambiguously determined [*eindeutig bestimmt*]". Only the three-dimensional "secondary world" of physics exhibits this determination, and thus the two "fictions" of three-dimensional space and thoroughgoing causal determination are bound inextricably together. In the course of his argument Carnap considers the following objection: the primary world is subject to determining laws after all, for all we have to do is substitute into the laws of physics the sensory

qualities that are uniquely [*eindeutig*] correlated with physical state-magnitudes, and physical laws then translate into laws governing sensations. Carnap replies precisely that the coordination between the secondary world and the primary world is many-one rather than one-one [*nicht eineindeutig, sondern mehreindeutig*]; therefore, it is not possible to translate physical laws into laws governing sensations (1924, p. 126).

Interestingly enough, Carnap presents parallel considerations in the *Aufbau*. Here the constitution of the world of physics takes place via the "physical-qualitative coordination" between the perceptual world (itself a coordination of first colors and then other sensory qualities to external spatial points) and the purely quantitative, numerical state-magnitudes of physics. However, the physical-qualitative coordination is "a one-many [*einmehrdeutig*] coordination between qualities and state-magnitudes", which does not correlate a unique [*eindeutig*] state-magnitude with a given (physical) sensory quality (§136). How then is it possible to constitute physical state-magnitudes in terms of such sensory qualities? How can we unambiguously translate statements about the former into statements about the latter? More generally, since the perceptual world is itself supplemented and corrected in light of the laws of physics, how is it possible to constitute the external world from sensations at all? And how is it then possible, as Carnap claims in §179, to translate all statements of science into "statements about the basic objects, namely, about relations between elementary experiences"?

Section 136 of the *Aufbau* refers us to Carnap (1923) for more details on the physical-qualitative coordination. Although Carnap repeats the claim that the coordination between "phenomenal facts" and corresponding state-magnitudes is only unique [*eindeutig*] in the direction from the latter to the former, he there outlines a procedure for nonetheless approximating to a unique assignment of physical state-magnitudes by focusing on a small neighborhood of a given phenomenally characterized space-time point and working back and forth using the laws of physics (1923, pp. 102–03). The crucial point is that the laws of physics, together with an unambiguous determination of phenomenal qualities from physical state-magnitudes, provide a methodological procedure for narrowing down the ambiguity in the assignment of physical state-magnitudes: in principle, a unique assignment is thereby constructed

after all. It appears, then, that in §136 of the *Aufbau* Carnap intends to achieve an unambiguous constitution of the world of physics by just such a methodological procedure.

But what is the epistemological status of the laws of physics and the resulting methodological procedure? The answer of Carnap (1923) is perfectly clear: they are the result of conventional choice or "stipulation [*Festsetzung*]" subject to "the principle of simplicity". And it is clear from §136 that this is the position of the *Aufbau* as well: the world of physics is unambiguously determined via the physical-qualitative coordination *plus* conventional stipulations.[16] More generally, the same result holds for the constitution of the visual things in §§126–28: the assignment of colors to world-points becomes unambiguous only in the context of the methodological principles of continuity and constancy (together with the further supplementations and corrections noted above); and, although Carnap never discusses the matter explicitly, it is clear that these principles, too, are conventions or stipulations.[17] In the end, therefore, the entire constitution of the external world is determined from sensory data on the basis of a complicated system of physical and methodological conventions or stipulations which are intended to do nothing more or less than encode the actual (although largely unconscious) rules science follows in constructing its picture of the physical world. Only such a complicated system of conventions enables us – in principle, Carnap hopes – to translate all statements of science into statements about elementary experiences.[18]

It follows that Carnap's ultimate solution to the problem of the external world – in so far as such a solution is present at all in the *Aufbau* – is very far indeed from traditional empiricism and phenomenalistic foundationalism.[19] For the problem of the external world is finally solved, not simply in virtue of a purely sensory translation, but rather by the idea that the methodological procedures and assumptions actually deployed in developing our claims about the physical world are to be characterized as conventions or stipulations rather than as cognitions: accordingly, a demand for *their* "justification" is entirely inappropriate. In this way, rather than presenting a traditional empiricist or phenomenalist account of our knowledge of the external world, the *Aufbau* instead anticipates Carnap's later strategy of 'Empiricism, Semantics, and Ontology': the question of the reality of the external world dissolves into the "external question" of whether or not to accept and use the forms of expression of the "thing language". Such an

"external question" is of course not subject to rational dispute at all, but only to purely pragmatic considerations of convenience.[20]

2.

The above considerations suggest that the customary assimilation of the epistemological project of the *Aufbau* to that of the empiricist philosophical tradition has perhaps been too hasty. In §75, where Carnap first introduces the basic relation of his "logical-epistemological" constitutional system, he explicitly aligns his project with a rather different tradition:

> *Cassirer* ([*Substanzbegr.*] 292ff.) has shown that a science having the goal of determining the individual through contexts of laws [*Gesetzseszusammenhänge*] without its individuality being lost must apply, not class ("species") concepts, but rather *relational concepts*; for the latter can lead to the formation of series and thereby to the establishing of order-systems. It hereby also results that relations are necessary as first posits, since one can in fact easily make the transition from relations to classes, whereas the contrary procedure is only possible in a very limited measure.
>
> The merit of having discovered the necessary basis of the constitutional system thereby belongs to two entirely different, and often mutually hostile, philosophical tendencies. *Positivism* has stressed that the sole *material* for cognition lies in the undigested [*unverarbeitet*] experiential *given*; here is to be sought the *basic elements* of the constitutional system. *Transcendental idealism*, however, especially the neo-Kantian tendency (Rickert, Cassirer, Bauch), has rightly emphasized that these elements do not suffice; *order-posits* [*Ordnungssetzungen*] must be added, our "basic relations".[21]

Carnap here associates his project with recent developments within the tradition of neo-Kantian epistemology: in particular, with Ernst Cassirer's *Substanzbegriff und Funktionsbegriff* (1910), Heinrich Rickert's *Der Gegenstand der Erkenntnis* (1892), and Bruno Bauch's *Wahrheit, Wert und Wirklichkeit* (1923).[22]

This neo-Kantian tradition approaches epistemology in different terms, and from a different point of view, than does the empiricist epistemological tradition more familiar within contemporary analytic philosophy. The primary problem does not involve the justification of our beliefs, the refutation of philosophical skepticism, or the relative degrees of certainty and epistemic value of beliefs in various different categories. Instead, such neo-Kantian philosophers occupy themselves with what they take to be the prior problem of how "objective judgements" are possible in the first place: what makes such things as judgments – which are essentially capable of either truth or falsity, justifi-

cation or disconfirmation – possible? How does it come about that our thought, which initially appears to be confined to merely subjective representations or ideas intrinsically possessing neither truth nor falsity, acquires objective meaning or "relation to an object" so that questions of truth and falsity (and thus questions of epistemic justification) then apply?

Neo-Kantian epistemology begins with the conviction that neither "strict empiricism" nor "metaphysical realism" can provide a satisfactory solution to these problems. Strict empiricism is unsatisfactory because no such thing as an objective judgement can possibly be found among the essentially private, fleeting, and at best vaguely differentiated immediate data of sense; such data merely occur, but are neither true nor false, neither justifiable nor unjustifiable. Metaphysical realism is also unsatisfactory, however, because it attempts to base objectivity on the relation of sensory data to a "transcendent" object existing somehow behind the data, and it therefore cannot explain how access to objects and thus objective judgement is possible for us. Since it is clear, in any case, that our cognition must start from the immediate data of sense, metaphysical realism simply creates an unbridgeable gulf between thought and reality in virtue of which objective judgements are just as impossible for us as they are on a strictly empiricist of "positivist" conception. The problem, then, is to construct a new conception of "relation to an object" and thus of "reality" that shows how we can proceed from private, subjective sense impressions to truly objective judgements without positing transcendent objects existing behind our sensory data – that is, without positing *Dinge an sich*. In this way, the "problem of cognition [*Erkenntnisproblem*]" is intimately connected, for the neo-Kantians, with the "problem of reality [*Wirklichkeitsproblem*]".

The basic idea of the neo-Kantian solution is expressed in the paradoxical-sounding formula: the "real" or "actual" is made possible by the "unreal" or "non-actual". The "unreal" or "non-actual" is the realm of purely objective, timelessly valid laws of logic and mathematics: the realm of "necessities of thought [*Denknotwendigkeit*]". Following Lotze, we carefully distinguish between the realm of what "exists" or is "real" and the realm of what "holds [*gelten*]" or is "valid [*gültig*]".[23] In particular, the realm of validity is not constituted by existent entities or *Dinge an sich* located outside the sphere of our thought but rather by normative and objective (that is, intersubjectively valid) rules

or laws regulating or governing our thought. Such objective rules are exhibited, first and foremost, in pure mathematics and pure logic, but this in no way exhausts their epistemological function. On the contrary, their peculiarly epistemological function is precisely to transform the immediate data of sense by means of mathematics and logic into the objects of mathematical natural science: we thereby create or generate the world of reality or actuality. Sensation thus acquires "relation to an object" if, in Bauch's words, "it is arranged and adjusted in a context, precisely the context of objective necessities of thought or laws of validity".[24]

Cassirer illustrates the "peculiar interweaving of 'actual' and 'non-actual' elements, on which all natural-scientific theories rest" in a particularly striking way in his discussion of "ideal limiting structures", such as moving point-particles and the like (1910, chap. IV, §II). He diagnoses the "skeptical" and "empiricist" arguments of P. du Bois-Reymond, which reject such limiting structures on account of their unobservability, as resting on an incorrect conception of "the relation of *concept* to *existence*, of *idea* to *reality*". In fact, du Bois-Reymond's arguments present us with a false dichotomy:

> We must choose between these two world-views: either, with *empiricism*, we only posit as present that which can be individually exhibited in the actual representation, or, rather, with *idealism*, we assert the existence of structures that form the conclusion in thought of determinate series of representations but are never themselves immediately given.

The dichotomy is false, because it ignores precisely the circumstance that empirical actuality is generated by *idealizing* what is sensibly given in terms of the eternally valid laws of logic and mathematics:

> The aggregate of sensible things must be related to a system of necessary concepts and laws and be brought together to unity in this relation. But this process of thought certainly requires more than the mere combination and deformation of constituents of representations; it presupposes an independent and constructive activity, as is manifested most clearly in the creation of limiting structures. And *this* form of idealization must be also granted by the "empiricist", for without it the perceptual world would be not only a mosaic, but a true chaos.

No awkward questions concerning the "existence" of ideal limiting structures behind the phenomena will arise here: "For the existence [*Bestand*] of the ideal, which can alone be critically asserted and represented, asserts no more than the objective logical necessity of the idealization".

Cassirer concludes that we can proceed from private, subjective sense impressions to truly objective judgements, as desired, in a purely logical-epistemological fashion. "Transcendent-metaphysical" concepts are in no way required:

> Certainly the *metaphysical* concept of "transcendence" lies wholly outside this progress from the mere process of sense-impressions to determinate "objective" assertions. The transformation that takes place here, and which the natural-scientific concept first produces and makes possible, provides the sense-data with a new *form of being* [*Seinsform*] only in so far as they impress upon them a new *form of cognition* [*Erkenntnisform*]. (1910, chap. V, §I)

And, as we know, the required new form of cognition is impressed upon the data of sense by their being "brought together to unity" in a "context" provided by logically necessary objective laws of thought. In this sense, neo-Kantian epistemology endorses Russell's "supreme maxim in scientific philosophizing" as enthusiastically as does empiricist-phenomenalist epistemology.

This last point is centrally important, for it makes it clear that there can be other philosophical motivations for proceeding from immediate sense experience via "logical construction" to the totality of our scientific knowledge than the motivations of traditional empiricism and phenomenalistic foundationalism. Indeed, as we have seen, the neo-Kantian motivations for undertaking such an epistemological project are, in an important sense, precisely the reverse of those of traditional empiricism. In the empiricist tradition the immediate data of sense constitute the paradigm of knowledge and certainty: no epistemological doubts can possibly arise here. The point of a foundationalist "logical construction" on the basis of such data is then to transfer, as far as possible, the epistemic value and certainty of the immediate data of sense to the rest of our scientific knowledge. In the neo-Kantian tradition, by contrast, the immediate data of sense do not, by themselves, constitute objective knowledge at all. Such data are essentially subjective, private, fleeting, and imprecise; so no objective knowledge can possibly be found here. The point of proceeding from the data of sense via "logical construction" to our scientific knowledge is not, therefore, to transfer the epistemic status of the former to the latter, but rather to embed the data of sense in an objective logical-mathematical structure so that they themselves first become objective.[25] We might express the essential difference thus: in the first tradition *certainty* flows, as it

were, from the bottom up; whereas in the second tradition *objectivity* flows from the top down.

Now which type of philosophical motivation is most evident in the *Aufbau*? We saw in Section 1 above that the motivations of traditional empiricism appear to be hardly in evidence at all. Motivations closely akin to those of the neo-Kantians, however, are very clearly expressed. Indeed, the entire point of Carnap's technique of "quasi-analysis" is to make possible what he calls "purely structural definite descriptions" of the various sense qualities and sense modalities: definitions that individuate the various types of sensory objects in purely formal-logical terms making no reference whatever to their intrinsic phenomenal qualities. The visual field, for example, is the unique sense modality having exactly five dimensions – two of spatial location and three of hue, saturation, and brightness (see §§86, 88–91) – and this purely logical characterization suffices to distinguish the visual field from every other sense modality wholly independently of intrinsic sensory "qualitativeness" (see especially §91). Moreover, the point of this kind of characterization is precisely to transform apparently private and subjective entities into intersubjective, objective entities:

> [*E*]*very scientific statement can in principle be so transformed that it is only a structural statement.* But this transformation is not only possible, but required. For science wants to speak about the objective; however, everything that does not belong to structure but to the material, everything that is ostended concretely, is in the end subjective.
>
> From the point of view of constitutional theory this state of affairs is to be expressed in the following way. The series of experiences is different for each subject. If we aim, in spite of this, at agreement in the names given for the objects [*Gebilde*] constituted on the basis of the experiences, then this cannot occur through reference to the completely diverging material but only through the formal indicators of the object-structures [*Gebildestrukturen*]. (§16)

In this way, the constitutional system demonstrates that objective knowledge is possible *despite* its necessary origin in purely subjective experience.[26]

The epistemological significance of purely structural definite descriptions stands out most clearly, perhaps, in Carnap's discussion of the autopsychological basis and "methodological solipsism" (§§64–66). Carnap begins by pointing out that philosophical resistance to the idea of an autopsychological basis stems largely from the conviction that it is impossible to proceed from such a basis to an intersubjective world common to all subjects (§64). He then argues (§65) that "the given is

subjectless" and does not asymmetrically single out one experiencing subject from all others:

> The expressions "autopsychological basis" and "methodological solipsism" are not to be so interpreted as if we intended initially to separate the "*ipse*", the "I", from the other subjects, or as if one of the empirical subjects were singled out and declared to be the epistemological subject. Initially, there can be no question of either other subjects or the I. Both are first constituted – and indeed together – at a later stage.

Finally, §66, "[t]he problem of objectivity within an autopsychological basis", refers back to the discussion of purely structural definite descriptions in §§15–16 and re-emphasizes their importance in the constitution of objectivity:

> Only on the basis of this recognition, that *science is essentially structural-science* and that *therefore there is a way to constitute the objective proceeding from the individual stream of experience*, is the system form with autopsychological basis admissible.

Purely structural definite descriptions – and such definite descriptions alone – make the objectivity of cognition possible.

This solution to "the problem of objectivity within an autopsychological basis" should be compared with the discussion of the same problem in Mach (1886, chap. I, §12) – a discussion to which Carnap refers twice in the course of his own account of the problem (§§64, 65). For Mach, the problem of objectivity is solved solely on the basis of the circumstance that (in Carnap's terms) the given is subjectless. Mach's "elements" or sensory contents do not come initially attached to a self: the self, bodies, and other selves are only constructed subsequently in terms of differing organizations of the elementary given. Since the self, just as much as bodies and other selves, is "an ideal mental-economical unity, not a real unity", the elementary sensory contents are not confined to a particular individual, and intersubjectivity is therefore not a problem. For Carnap, by contrast, the circumstance that the given is thus subjectless in no way suffices to solve the problem of objectivity. On the contrary, this problem is solved only by self-consciously taking the additional step of defining all concepts of science purely structurally and by thereby embedding sensory contents themselves within a formal-logical "context" – namely, the theory of relations and theory of types provided by *Principia Mathematica*.[27] It is this that decisively separates the epistemological project of the *Aufbau* from that of Machian "positivism" and, as Carnap himself explicitly notes in §75, aligns his project rather with the "transcendental idealism" of the neo-Kantians.[28]

Carnap explains the conception common to neo-Kantian "transcendental idealism" and his own constitutional system in striking terms in the course of his discussion of the problem of reality [*Wirklichkeitsproblem*] in §177:

> Constitutional theory and *transcendental idealism* agree in representing the following position: all objects of cognition are constituted (in idealistic language, are "generated in thought"); and, indeed, the constituted objects are only objects of cognition as logical forms constructed in a determinate way. This holds ultimately also for the basic elements of the constitutional system. They are, to be sure, taken as basis as unanalyzed unities, but they are then furnished with various properties and analyzed into (quasi-) constituents (§116); first hereby, and thus also first as constituted objects, do they become objects of cognition properly speaking – and, indeed, objects of psychology.[29]

Since §116 (compare §93) presents the actual constitution of *sensations*, defined via a purely structural definite description containing only the basic relation itself as non-logical primitive, the neo-Kantian conception, which views "the inclusion of sensation in the context of necessities of thought or laws of validity as presupposition of sensation itself" (see note 25 above), could hardly find clearer or more precise expression.

3.

In so far as traditional epistemological motivations are present at all in the *Aufbau*, those of the neo-Kantianism tradition are therefore much more explicitly in evidence than those of the empiricist tradition.[30] Nevertheless, it would be just as mistaken to assimilate the epistemology of the *Aufbau* to neo-Kantianism as it is to assimilate it to empiricism. Indeed, in the two texts where neo-Kantian motivations are most clearly expressed – §75 and §177 – Carnap also explicitly underscores his agreement with "positivism" and phenomenalistic empiricism. In §177 the latter position is subsumed under the rubric of "subjective idealism":

> Constitutional theory and *subjective idealism* agree in that all statements about objects of cognition can be in principle transformed into statements about structural interconnections [*Strukturzusammenhänge*] of the given (with retention of logical value, see §50). With *solipsism* constitutional theory shares the conception that this given consists of my experiences.

And this agreement between the constitutional system and (Machian) positivism is especially obvious in §160:

The constitutional system shows that all objects can be constituted from "my elementary experiences" as basic elements; in other words (for this is what the expression "to constitute" means), all (scientific) statements can be transformed with retention of logical value into statements about my experiences (more precisely, about relations between them). *Every object* that is not itself one of my experiences is thereby a quasi-object; its name is *an abbreviational auxiliary* [*abkürzendes Hilfsmittel*] for speaking about my experiences. Indeed, its name within constitutional theory and therefore within rational science is *only* an abbreviation . . . .[31]

There is no doubt, then, that the constitutional system does realize the demand for a reduction or translation of all scientific statements in terms ultimately of the experimental given, and this feature of the constitutional system does clearly align it with the empiricist-positivist tradition.[32]

Carnap's official aim, however, is to represent neither the empiricist-positivist tradition nor the neo-Kantian tradition. For constitutional theory is officially neutral with respect to all disputes among different epistemological tendencies (§178):

[*T*]*he so-called epistemological tendencies of realism, idealism, and phenomenalism agree within the domain of epistemology. Constitutional theory represents the neutral basis* [*neutrale Fundament*] *common to all. They first diverge in the domain of metaphysics and thus* (*if they are to be epistemological tendencies*) *only as the result of a transgression of their boundaries.*

Since all epistemological tendencies agree that we begin with the data of experience and proceed from there via a "logical progress" to all other objects of cognition (see note 13 above), disagreements arise only if we pose questions about which objects of cognition are "metaphysically real". But the constitutional system rejects "the metaphysical concept of reality" altogether (§176) and thus precisely represents what all epistemological tendencies agree upon while simultaneously rendering their remaining disagreements inexpressible. In so far as there is a disagreement between the empiricist-positivist tradition and the neo-Kantian tradition, then, constitutional theory itself steadfastly refuses to take sides.[33]

Carnap's neutral and distant attitude towards the neo-Kantian tradition, in particular, is explicitly expressed very early on in the *Aufbau*:

Are the constituted structures "generated in thought", as the Marburg School teaches, or "only recognized" by thought, as realism asserts? Constitutional theory employs a neutral language; according to it the structures are neither "generated" nor "recognized", but rather "*constituted*"; and it is already here to be expressly emphasized that this

word "constitution" is always meant completely *neutrally*. From the point of view of constitutional theory the dispute involving "generation" versus "recognition" is therefore an idle linguistic dispute. (§5)

Yet it is not immediately clear what the force of Carnap's own distinction between "generation" and "constitution" is – especially since, as we have seen, Carnap says he agrees with transcendental idealism in §177 that all objects of cognition are "generated in thought".[34]

The title of §5 is "Concept and object", and its main point is to argue that "the generality of a concept appears to us to be relative, and therefore the boundary between general concept and individual concept can be shifted in accordance with the point of view (see §158)". One important source of this relativity arises from what Carnap calls "the constitutional levels" (§40) – namely, the type levels of *Principia Mathematica*. Thus objects of any type other than the first appear as both classes (relative to objects of lower type) and objects or individuals (relative to objects of higher types). Carnap characterizes a class of objects as a "quasi-object" relative to its members and articulates "the *relativity of the concept 'quasi-object'*, which holds of an object of any constitutional level in relation to the objects of preceding levels". In the terminology of §5, therefore, "to every concept there belongs one and only one object, 'its object' (not to be confused with the objects falling *under* the concept)". The concept is the object viewed as a class, and thus in relation to lower levels in the hierarchy of types, whereas the corresponding object is the concept viewed as a member of classes in turn, and thus in relation to higher levels in the hierarchy of types. The structures thereby constituted can thus be viewed indifferently as either concepts or objects.

In §41 Carnap applies this relativity to philosophical-ontological distinctions among various "modes of being [*Seinsarten*]", specifically, to the distinction between "being and holding [*Sein und Gelten*]":

Fundamentally, the *distinction between that which has being and that which has validity* [*dem Seienden und dem Geltenden*], which has been much emphasized in modern philosophy, also traces back to the distinction of object spheres – more precisely, to the distinction between proper objects and quasi-objects. Namely, if a quasi-object is constituted on the basis of certain elements of its domain that it "holds [*gilt*]" for these elements; thereby it is distinguished as having validity [*als Geltendes*] from the elements as having being [*als Seienden*].

Since, as §40 has shown, the distinction between proper object and quasi-object is a relative one, it now follows that the distinction between

being and holding is relative as well: "The concepts of being and holding are therefore relative and express the relation of each constitutional level to the immediately following one".

Now we saw in Section 2 above that a sharp distinction between being and holding, between the realm of concepts and the realm of objects, between the real or actual and the ideal or non-actual is central to neo-Kantian epistemology. The real world of experience is contrasted with the ideal world of thought, whose "mode of being" consists in validity [*Geltung*] or necessity of thought [*Denknotwendigkeit*] rather than existence or actuality. Nevertheless, the real world of experience is made possible by the ideal world of thought; for only so are *objective judgements* about the real objects of experience possible. The idea is expressed succinctly in the following passage from Rickert:

> We therefore arrive at two worlds: a world of being [*einer seienden*] and a world of validity [*einer geltenden*]. But between them stands the theoretical subject, which combines the two through its *judgements* – whose essence is only understandable in this way – and without which we would not even be able to speak sensibly about existent [*seienden*] or real "objects" of cognition.[35]

A quasi-Platonic, ontological distinction between real and ideal worlds – between the realm of being and the realm of validity – is thus fundamental to the neo-Kantian conception of the objects of cognition.[36]

In §41 of the *Aufbau*, by contrast, the distinction in question has been completely deflated. A philosophical distinction between two sharply separated "modes of being" has been transformed into a purely logical and explicitly relative distinction between an arbitrary rank in the hierarchy of types and the immediately succeeding rank. No traditional epistemological or ontological question is involved in the latter distinction, and this explains why Carnap, in §5, asserts that the closely related distinction between concept and object is a matter of complete indifference:

> Whether a certain object-sign means the concept or the object, whether a proposition holds for concepts or for objects, signifies no logical distinction but at most a psychological one – namely, a distinction in the representing ideas [*repräsentierenden Vorstellungen*]. In principle, there is absolutely no question of two different conceptions but only of two different interpretative manners of speaking. In constitutional theory we therefore sometimes speak of constituted objects, sometimes of constituted concepts, without making an essential distinction.

These two parallel languages, which speak of objects and of concepts and still say the same thing, are fundamentally the *languages of realism and idealism*.

This is the precise sense in which constitutional theory is indeed neutral between realism and idealism, and hence between "recognition" and "generation in thought".[37] Accordingly, when Carnap explicitly articulates his points of agreement with "transcendental idealism" in §177 he is careful to maintain his neutrality: "[A]ll objects of cognition are constituted (*in idealistic language*, are 'generated in thought')" (emphasis added).

Carnap's distinction between realistic and idealistic languages is in fact the key to his philosophical neutrality. In §95 Carnap explains that the constitutional system can be presented in four different languages. However, "[*t*]*he fundamental language of the constitutional system is the symbolic language of logistics*" – that is, the language of *Principia Mathematica* (§107) – while "[t]he remaining three languages only provide translations of the logical fundamental language". The three remaining languages are then "a simple *translation in words*", "the translation in the *realistic languages*", and finally "the *language of a fictional construction* [*Sprache einer fiktiven Konstruktion*]".[38] In the last language we view the strictly logical constitutional definitions (first language) "*as operational rules for a constructive procedure*", whereby "we have the task of prescribing for a given subject, designated as A, step by step operations through which A can arrive at certain schemata (the 'inventory-lists') corresponding to the individual objects to be constituted (§102)" (§99).

In the language of a fictional construction we thus represent our subject A as undertaking a "synthesis of cognition [*Erkenntnissynthese*]" starting from the "given" (§100), on the basis of "synthetic components, and thus the constitutional forms" (§101). Since "[b]y *categories* are understood the forms of synthesis of the manifold of intuition to unity of the object", and since "[t]he manifold of intuition is called in constitutional theory 'the given', 'the basic elements'" while "[t]he synthesis of this manifold to unity of an object is here designated as constitution of the object from the given" (§83), it follows that we can, if we like, view our subject A as undertaking a "synthesis of cognition" via "categories". There can be little doubt, then, that the language of a fictional construction is precisely the language of (transcendental) idealism. Whereas in the realistic language we view our

constitutional definitions as capturing or representing independently given objects – the familiar objects of the empirical sciences (§98, compare §§52, 75, 178), in the idealistic language we view our constitutional definitions as synthesizing or generating objects via the operations or constructions of a given cognitive subject.

The important point here, however, is that for Carnap the language of a fictional construction is indeed purely "auxiliary" or "fictional". The cognitive subject A, the step by step construction from the given, and the operations or acts of synthesis are all strictly speaking fictions, by which the underlying constitutional definitions are heuristically expressed "as palpable processes" (§99): "It is to be emphasized that *the constitutional system itself has nothing to do with these fictions*; they are referred only to the fourth language, and this serves only the didactic purpose of illustration". Similarly, although Carnap intends to give a rational reconstruction of the actual (empirical) process of cognition, he is careful to point out that the constitutional system itself involves no psychological processes whatsoever:

> Since the constitution indicates this function [a particular psychophysical correlation] the course of the process of cognition is not somehow falsely presented through the constitution (namely, as a rational-discursive [process] instead of an intuitive one). (The latter occurs only in the language of a fictional construction, which can be given alongside as an intuitive aid.) The constitution itself indicates no process at all, but only the logical function is question. (§143)

For Carnap the fundamental language is always the purely formal-logical language of *Principia Mathematica* – wherein no cognitive subjects, no synthetic processes, and no acts or operations of construction are in fact to be found. On the contrary, in the strict "constitutional language" (§52) we have only a purely logical sequence of definitions formulated in a type-theoretic language containing a single non-logical primitive.

For the neo-Kantians, by contrast, the language of cognitive subjects, synthetic processes, and acts or operations of thought is in no way dispensable. This is particularly evident in Cassirer's polemic against the anti-psychologistic, mind-independent conception of logic and mathematics articulated in Russell's *Principles of Mathematics*. Cassirer (1910, chap. VII, §II – "The Relational Concepts and the Activity of the I") puts forward a "genetic" view of cognition on which "[i]t realizes itself only in a succession of logical acts, in a series, which must be

successively run through in order that we become conscious of the rule of its progress". Accordingly, he explicitly opposes Russell's attempt wholly to remove the concept of the thinking subject from the realm of pure logic and mathematics so that "all closer relation of the ideal truths of mathematics and logic to the activity of thought falls away". Cassirer holds, on the contrary, that a "movement of thought" or an "act of production" is necessarily required.

Indeed, from the point of view of the neo-Kantians, it is clear why this must be so. We start with a fundamental ontological distinction between the essentially timeless realm of validity or pure thought and the essentially temporal realm of reality or actuality; and we hold, moreover, that the latter is made possible in virtue of its "peculiar interweaving" with the former. We therefore need an intermediary standing between the two realms, as it were, and this is precisely the "thinking subject" (compare the above quotation from Rickert) – through which reality is "generated" by a succession of "logical acts". Thus, although the neo-Kantians explicitly oppose psychologism with respect to the realm of pure thought or pure logic [*reine Logik*], they nonetheless embrace an essentially psychological element in their account of the process of cognition. We are not here involved with *empirical* psychology, of course, but rather with the "*transcendental* psychology" of the "transcendental subject".[39]

Yet the *Aufbau*, as we have seen, dissolves the fundamental ontological distinction of the neo-Kantians into the purely formal-logical distinction between objects and quasi-objects. Accordingly, Carnap himself has no need whatsoever for the "transcendental subject". Pure formal logic suffices to ground the objectivity of cognition all by itself, and no additional "transcendental psychology" is required:

> Many of the current objections to the autopsychological basis (or to "methodological solipsism") may be explained in terms of the failure to recognize this fact and this way [that science deals with logical structure and therefore objectivity is still possible in the context of an autopsychological basis] – and perhaps also many other formulations for the initial subject, such as, e.g., "transcendental subject", "cognitive subject", "trans-individual consciousness", "consciousness in general", which are perhaps to be interpreted as makeshift expedients [*Notbehelfe*], since one saw no way to the intersubjective [proceeding] from the natural initial point in the sense of an epistemological order of objects, namely from the autopsychological (compare the citations in §64). (§66)

And for Carnap, of course, the "natural initial point" is entirely "subjectless" (§65); an epistemological subject appears only in the language

of a fictional construction. Once again, in the logically strict constitutional language we have only a purely formal sequence of definitions – a sequence that happens to begin with a non-logical primitive belonging to the domain of the autopsychological. Beyond this the constitutional system has no more intrinsic connection with psychology than it has with any other empirical science (compare note 12 above).

In sum, the relationship between the *Aufbau* and neo-Kantian epistemology can perhaps best be expressed as follows. The neo-Kantians begin with an explicitly anti-psychologistic conception of pure thought of pure logic intended to ground the objectivity of empirical cognition. The epistemological motivations of the *Aufbau* are in very substantial agreement with this idea. When the neo-Kantians put this idea into effect, however, the result is a fundamental philosophical-ontological distinction between two "modes of being" and a corresponding transcendental-psychological account of the "acts of synthesis" of the cognitive subject. For Carnap, by contrast, the notion of pure thought or pure logic is epitomized rather by the new mathematical logic of Frege and Russell, now considered as a powerful vehicle for dissolving philosophical confusion via logical-mathematical construction (compare note 32 above). Carnap has been especially impressed, in particular, by Russell's conception, articulated in the second chapter of *Our Knowledge of the External World*, of "Logic as the Essence of Philosophy".[40] Epistemology in the *Aufbau* therefore becomes a logical-mathematical constructive project rather than a philosophical project in the traditional sense, and this logical-mathematical project is then a *replacement* for traditional epistemology (see the preface to the first edition). Carnap's claim to complete philosophical neutrality in the end cuts deeply indeed.[41]

4.

The above analysis results in a very different picture of the epistemological significance of the *Aufbau* than that which has been customary within contemporary Anglo-American philosophy. The *Aufbau* is not best understood as starting from fundamentally empiricist philosophical motivations and then attempting to put these into effect – on the basis of the new mathematical logic of *Principia Mathematica* – in a more precise and rigorous way than had been previously possible. The epistemological motivations of the *Aufbau* begin rather with the concerns

and problems of the neo-Kantian tradition: with a concern for depicting how the cognitive process transforms inherently private and subjective sensations into fully objective experience capable of validity and truth, and the problem of carrying out this project is an essentially "logical" – that is, non-metaphysical and non-psychological – fashion. Yet the neo-Kantians themselves (for present purposes, Rickert, Bauch, and Cassirer) are not able fully to achieve such a purely logical standpoint, principally because they are not in possession of a sufficiently rich and determinate conception of logic itself. The neo-Kantians are instead left in the somewhat uncomfortable position – almost in spite of themselves, as it were – of appealing to ontological distinctions among various "modes of being" and psychological accounts of the activities of the cognitive subject. In the *Aufbau*, however, the new mathematical logic of *Principia Mathematica* provides Carnap with all the philosophical concepts and distinctions he needs. Carnap thereby achieves a standpoint that is both non-psychological and truly metaphysically neutral, and, at the same time, he transforms the neo-Kantian tradition into something essentially new: "logical-analytic" philosophy.[42]

This picture of the epistemological significance of the *Aufbau* harmonizes particularly well with Carnap's early philosophical development.[43] Carnap's first published work, *Der Raum* (1922; his doctoral dissertation), explicitly articulates a modified Kantian conception of space. Kant was wrong, to be sure, in thinking that three-dimensional Euclidean space is an *a priori* necessary condition of the possibility of experience. Nevertheless, Kant was perfectly correct about the experience-constituting function of space – it is just that a more general structure is required:

> It has already been explained more than once, from both mathematical and philosophical points of view, that Kant's contention concerning the significance of space for experience is not shaken by the theory of non-Euclidean spaces, but must be transferred from the three dimensional Euclidean structure, which was alone known to him, to a more general structure..... According to the foregoing reflections, the Kantian conception must be accepted. And, indeed, the spatial structure possessing experience-constituting significance (in place of that supposed by Kant) can be precisely specified as topological intuitive space with indefinitely many dimensions. We thereby declare, not only the determinations of this structure, but at the same time those of its form of order [n-dimensional topological *formal* space] to be conditions of the possibility of any object of experience whatsoever.[44]

Accordingly, the main point of *Der Raum* is to show how the contem-

porary philosophical disputes about the nature of space and geometry can be dissolved by distinguishing among three distinct "meanings" of space. Formal space is a purely logical structure constructed within the theory of relations or theory of order; it therefore has the formal or analytic character defended by such thinkers as Russell and Couterat (chap. I). Intuitive space, by contrast, is given to us by a kind of non-formal (but also non-inductive) sensory procedure; here we in fact find the Kantian synthetic *a priori*, but only *infinitesimally* Euclidean properties (topological properties sufficient to admit some or another Riemannian metrical structure) are thereby intuitively given (chap. II). Physical space, finally, is constructed by fitting actual empirical data into the already given space of intuition; here we conventionally choose a particular determinate metrical structure for space and also (in accordance with the empirical data and the methodological principle of simplicity) a particular determinate dimension number (chap. III).

Carnap's early conception is therefore characterized by two different levels of non-empirical, experience-constituting structure. Topological structure is necessary and unique, but metrical structure is subject to conventional choice from among a wide spectrum of alternatives (all the geometries definable within Riemann's theory of manifolds). Carnap (1922, pp. 38–40) marks this distinction by a "division within the realm of form between necessary and optional [*wahlfreier*] form": the former comprises the topological structure without which no experience at all is possible; the latter comprises the particular metrical geometry (and dimension number) freely chosen on conventional (and methodological) grounds. The point is that some or another metrical structure is indeed necessary for fully objective (scientific) experience, but no such particular structure is *a priori* given. The metrical structure of physical space – precisely because it, too, is experience constituting – cannot be determined empirically but is instead entirely up to our free choice.[45]

The distinction between necessary and optional form is then applied in Carnap (1924), where the first hint of an *Aufbau*-style construction of the external world from the "given" appears in print (see note 10 above). Carnap's aim there is to explain how the "secondary world" of physical objects arises from the "primary world" of immediate sensations on the basis of the "fictions" of three-dimensional space and thoroughgoing causal determination; and Carnap begins by situating his project in relation to neo-Kantianism in a particularly striking fashion:

> The neo-Kantian philosophy is not acquainted with the primary world, since their conception that the forms of experience of [the secondary world] are necessary and unique prevents them from recognizing the distinction between the primary and the secondary world. Their true achievement, namely, the demonstration of the object-generating function of thought, remains untouched, however, and underlies our conception of the secondary world as well. (1924, p. 108)

The first sentence of this passage may well suggest that Carnap is aligning himself with positivist-empiricist epistemology here.[46] It quickly becomes clear, however, that Carnap's conception of the "primary world" does not rest on an empiricist preoccupation with the certainty and foundational role of immediate sensory experience, but rather on precisely the distinction between necessary and optional form previously articulated in *Der Raum*.[47] Carnap's complaint against the neo-Kantians is simply that they fail to recognize the importance of conventional – and thus freely chosen or optional – factors within "the object-generating function of thought".[48]

There can be little doubt, therefore, that the project of the *Aufbau*, although by no means entirely independent of the empiricist-positivist tradition, originates within a primarily Kantian and neo-Kantian philosophical context. Experience is to be constituted from sensation on the basis of forms imposed by thought, but these forms are increasingly deprived of the fixed, synthetic *a priori* character ascribed to them by Kant. Indeed, in the *Aufbau* itself no remaining trace of the synthetic *a priori* can be found.[49] In particular, Carnap makes no distinction between necessary (intuitive) and optional (conventional) form: all form is now purely *logical* form, and only conventions and the analytic *a priori* remain.[50] Accordingly, in the *Aufbau* the "primary world" has even less of a position of epistemic privilege than it had in Carnap (1924). The autopsychological realm and the physical realm are no longer marked off from one another by the distinction between necessary and optional form but simply in virtue of their purely logical differences as distinct "object-spheres" within a type-theoretic hierarchy (compare §132 and note 18 above). And this last is of course just the kind of revolutionary philosophical move to which we have called attention above – a move by which Carnap simultaneously distances himself from both the neo-Kantian tradition and the empiricist-positivist tradition.

Yet, as we saw in Section 1, Carnap (1963) retrospectively describes the motivations of the *Aufbau* in the most explicitly empiricist and

phenomenalist terms imaginable. There is "a certain rock bottom of knowledge, the knowledge of the immediately given", and "the task of philosophy consists in reducing all knowledge to a basis of certainty". Therefore "a phenomenalistic language [is] the best for a philosophical analysis of knowledge". Since, as we also saw in Section 1, such a phenomenalist-foundationalist conception is hardly in evidence in the text of the *Aufbau* itself, and, as we have just seen, this is equally true of Carnap's pre-*Aufbau* writings, Carnap's retrospective account is puzzling indeed. It is not unprecedented, of course, for the character and motivations of an earlier and now rejected philosophical project to be grossly misdescribed – even by the philosopher whose earlier views are in question. Nevertheless, some explanation is still required, at the very least, for why Carnap has chosen here to describe his earlier views in precisely these terms.

My suggestion is that in the passages in question from his 'Intellectual Autobiography' Carnap is describing not so much his own motivations when writing the *Aufbau* but rather the way in which the *Aufbau* was initially understood within the Vienna Circle. That this may well be the case is already indicated by the contexts in which each of the two passages occur; for both occur in the course of discussion of how the (majority of the) Circle moved away from a preference for a phenomenalistic language and, under Neurath's influence, towards a preference for a physicalistic language. Thus the first passage occurs in a section on "Physicalism and the Unity of Science" and is bracketed by the following sentences:

> In our [the Vienna Circle's] discussions we were especially interested in the question whether a phenomenalistic language or a physicalistic language was preferable for the purposes of philosophy.... In the Vienna discussions my attitude changed gradually toward a preference for the physicalistic language. (1963, p. 50)

A discussion of Neurath's arguments for physicalism occupies the next two pages. The second passage occurs in a section on "Liberalization of Empiricism" and is introduced as follows:

> The simplicity and coherence of the system of knowledge, as most of us in the Vienna Circle conceived it, gave it a certain appeal and strength in the face of criticisms. On the other hand, these features caused a certain rigidity, so that we were compelled to make some radical changes in order to do justice to the open character and inevitable uncertainty of all factual knowledge.
>
> According to the original conception, the system of knowledge, although growing

constantly more comprehensive, was regarded as a closed system in the following sense. We assumed that there was a certain rock bottom of knowledge .... (1963, pp. 56–57)

Neurath's (and Popper's) arguments against such a "rock bottom of knowledge" are then discussed in some detail. Here Carnap is of course describing the well-known protocol sentence debate, which split the Vienna Circle into a "left wing" (anti-foundationalism), represented by Neurath, Hahn, and Carnap, and a "right wing" (foundationalism), represented by Waismann and Schlick.

Now, with respect to the *Aufbau* itself, we know that Carnap completed a first draft in 1922–25 while living in Jena and Buchenbach. He became acquainted with Schlick in the summer of 1924 (through Reichenbach) and lectured on the *Aufbau* in Vienna to Schlick's Philosophical Circle in 1925. In 1926 Carnap joined the University of Vienna, and a typescript of the first version of the *Aufbau* was read and intensively discussed at meetings of the Circle.[51] Carnap describes the initial reception as follows:

From the very beginning, when in 1925 I explained in the Circle the general plan and method of *Der logische Aufbau*, I found a lively interest. When I returned to Vienna in 1926, the typescript of the first version of the book was read by the members of the Circle, and many of its problems were thoroughly discussed. Especially the mathematician Hans Hahn, who was strongly interested in symbolic logic, said that he had always hoped that somebody would carry out Russell's program of an exact philosophical method using the means of symbolic logic, and welcomed my book as the fulfillment of these hopes. Hahn was strongly influenced by Ernst Mach's phenomenalism, and therefore recognized the importance of the reduction of scientific concepts to a phenomenalistic basis, which I had attempted in the book. (1963, p. 20)

It appears, then, that at Vienna the *Aufbau* was introduced into a philosophical context already predisposed towards phenomenalistic empiricism.

What we know about the background and early history of the Vienna Circle is entirely consistent with this idea. Ernst Mach himself was the first occupant of the chair for philosophy of the inductive sciences at the University of Vienna from 1895–1901. In the years 1907–12 a group of Viennese scientific thinkers deeply influenced by Mach (as well as by the French "neo-positivists" Duhem, Poincaré, and Rey) met regularly to discuss philosophy of science and "the decline of mechanism". This group was led by Philipp Frank, Otto Neurath, and Hans Hahn, and has been dubbed the 'First Vienna Circle'.[52] Although the First Vienna Circle ceased to meet regularly in 1912, when Frank went to

Prague, its members remained in contact and continued to pursue and defend Machian ideas. Indeed, they saw Einstein's construction in 1915–16 of a relativistic theory of gravitation as a particularly striking proof of the scientific fruitfulness of Mach's positivist critique.[53] Schlick, at Rostock and Kiel, was at the same time moving towards a very similar understanding of the philosophical significance of Einstein's theory.[54] The result was that Hahn succeeded in bringing Schlick to Vienna to occupy the chair for the philosophy of the inductive sciences in 1922, and what we now know as the Vienna Circle was born.[55]

When Carnap was brought to Vienna by Schlick in 1926 he therefore found himself in a philosophical climate within which the phenomenalist-empiricist aspects of the *Aufbau* were bound to be given the most prominent emphasis. This still does not account for the foundationalist concern with certainty and a "rock bottom of knowledge" manifest in our passages from Carnap (1963), however, for Machian phenomenalism does not itself amount to foundationalism.[56] The most important factor responsible for such a foundationalist reading of Machian phenomenalism – and therefore of the *Aufbau* as well – was undoubtedly the assimilation within the Vienna Circle of Wittgenstein's *Tractatus*. For the Circle understood the *Tractatus* as articulating a foundationalist-empiricist conception of *meaning*. Definitions explain the meanings of words in terms of other words; but this procedure cannot go on to infinity, or else no word ultimately has meaning at all; therefore, all meaning must finally rest on primitive acts of ostension, and what is ostended must be immediately given:

> Definitions are ultimately reducible to ostension of what is designated. One can point only at something which is immediately given, and thus only at what is perceivable. In this way, what assertions can possibly mean is tied to experience. No meaning can be given to that which is not reducible to experience; and this is a consequence of fundamental importance.[57]

And there is no doubt that this conception of meaning – and this understanding of the *Tractatus* – was adopted especially by Waismann and Schlick.[58] It was then entirely natural to read Carnap's *Aufbau* as the precise realization of just such a "Tractarian" theory of meaning.[59]

The connection between this foundationalist conception of meaning and foundationalist epistemology is made explicitly in Schlick (1934). In the opening paragraph Schlick describes the traditional need of philosophy "to seek an unshakeable foundation which is removed from

all doubt and forms the firm ground on which the unsteady structure of our knowledge is erected", to seek "the natural bedrock [*natürlichen Felsen*] which exists *before* all building and does not itself totter". Schlick then finds such "bedrock" in his notorious "affirmations [*Konstatierungen*]", which ostensively and demonstratively report on a sensory content present here and now. But why exactly are such "affirmations" absolutely certain? As in the parallel case of analytic propositions, a knowledge of their truth is simply inseparable from a grasp of their meaning:

> In other words, I can understand the sense of an "affirmation" only when, and only whereby, I compare it with the facts and thus carry out that process that is required for the verification of all synthetic propositions. Whereas, however, in the case of all other synthetic assertions the establishing of the sense and the establishing of the truth are separate and easily distinguishable processes, in the case of observational propositions the two coincide – just as in the case of analytic propositions. Thus as different as the "affirmations" are from analytic propositions otherwise, they still have in common with them that in both cases the process of understanding is at the same time the process of verification – I grasp the truth at the same time as the sense. In the case of an affirmation it would have just as little sense to ask whether I could perhaps be mistaken about its truth as it would in the case of a tautology. Both are absolutely valid. Only the analytic proposition or tautology is at the same time empty of content, while the observational proposition provides us the satisfaction of genuine cognition of reality. (1934, §VII)

To grasp the meaning of an affirmation is to be ostensively confronted with the very fact whose existence it reports. Error is therefore impossible, and we have thus found the true foundation of all (synthetic) knowledge.

Carnap's own writings from this period exhibit a strikingly different character.[60] Although he of course also adopts the verifiability theory of meaning and acknowledges the importance of Wittgenstein's *Tractatus* in this regard, Carnap does not embrace the empiricist foundationalism articulated by Waismann and Schlick. For, in the first place, the notion of ostension plays no role at all in his conception of meaning, which continues to be explained purely formally: to know the meaning of a sentence S is to know which sentences S is deducible from and which sentences are deducible from S.[61] To be sure, there is a special class of sentences, the protocol sentences, against which all other (non-analytic) sentences are tested – by deducing sentences of this special class from sentences in the latter class. Nevertheless, in the second place, these protocol sentences need not be related to "immediate experience" in any antecedently understood sense. Indeed, Carnap

explicitly leaves to one side the question of the content of such protocol sentences and, in particular, whether protocol sentences have the form of (a) Machian sensation reports, (b) *Aufbau*-style reports of holistic elementary experiences, or (c) reports about ordinary observable things.[62] And there can clearly be no question of absolute certainty à la Schlick in case (c). It follows, in the third place, that the sense in which protocol sentences are epistemically privileged is also purely formal: other sentences are tested (and accordingly accepted or rejected) by the logical deduction of protocol sentences, but protocol sentences (trivially) are not so tested in turn. Protocol sentences are simply the logical termini of the procedure of testing or verification.[63]

The fourth point of difference between Carnap and the Schlick–Waismann conception is perhaps most significant of all. For Carnap continues to hold, as he did in the *Aufbau*, that there are two essentially distinct but equally useful ways of reconstructing the language of science. The first way, corresponding to the standpoint of "methodological positivism", consists in beginning with protocol sentences – considered as distinguishable from the rest of the language of science – and exhibiting the logical relations in virtue of which all other sentences of science are epistemically based on the protocol sentences. The second way, corresponding to the standpoint of "methodological materialism", consists in beginning with the basic language of physics and translating all other sentences – including the protocol sentences (which, from this point of view, appear simply as sentences of empirical psychology, say) – into the language of physics. Moreover, Carnap continues to hold that the materialistic or physicalistic system is the most appropriate system for representing the content of science as a completely unified and fully intersubjective body of knowledge:

> We speak of "methodological" positivism or materialism, respectively, because we are here concerned with only the method of conceptual derivation, while the metaphysical-positivistic thesis of the reality of the given and the metaphysical-materialistic thesis of the reality of the physical remain completely excluded here. Therefore, positivistic and materialistic constitutional systems do not contradict one another. Both are legitimate and unavoidable. The positivistic system corresponds to the epistemological viewpoint, because in it the validity of a cognition is shown through reduction to the given [*da sich in ihm die Gültigkeit einer Erkenntnis durch Rückführung auf das Gegebene erweist*]. The materialistic system corresponds to the standpoint of the [empirical] sciences, because in it all concepts are reduced to the physical – to the only domain that exhibits thoroughgoing law-governedness and makes intersubjective knowledge possible.[64]

In the context of the protocol sentence debate Carnap therefore needed only the smallest push from Neurath to break decisively from the Schlick–Waismann wing – that is, from the "absolutism of the 'given'", and even from the "refined absolutism of the primitive sentence".[65]

All the evidence then suggests that, when Carnap uses empiricist-foundationalist language in his 'Intellectual Autobiography', he is not really describing his own views – and he is certainly not describing the actual motivations of the *Aufbau*. He is rather depicting the philosophical dialectic between the "right wing" and the "left wing" of the Circle in a particularly clear and dramatic fashion. And, although there is no doubt that the *Aufbau* – particularly as read by Schlick and Waismann – played a central role in this dialectic, Carnap himself was never moved by epistemological foundationalism. Carnap's position did indeed change significantly after the confrontation with Neurath in the protocol sentence debate, but this change did not consist in the abandonment of foundationalist epistemology in particular (to which he was never attracted in any case). What Carnap gave up was any interest in traditional epistemology and its rational reconstruction at all.[66] He instead came to see that the metaphysical neutrality which he sought throughout his philosophical career could best be achieved in the context of logical investigation into the formal structure of any and all constitutional systems – or, to use his later terminology, into the structure of any and all formal languages or linguistic frameworks. But this is a story for another day.

NOTES

* An earlier version of this paper was presented at a meeting of the Boston Colloquium for Philosophy of Science celebrating the Rudolf Carnap Centennial in October, 1991. I am indebted to the participants in this meeting – particularly to Robert Nozick, Willard van Orman Quine, Abner Shimony, and Howard Stein – for helpful comments and suggestions. I am also especially indebted to related work of, and discussion with, Burton Dreben, Alan Richardson, and Thomas Uebel.

[1] Carnap (1982a; English translation by R. George in Carnap 1967). In my quotations I have found it necessary to deviate from the George translation at various points. In particular, although "construction theory" and "constructional system" are certainly preferable in English to "constitutional theory" and "constitutional system", the former terminology masks certain important distinctions which will be explained below. My terminology here follows that of Sauer (1989). All references to the *Aufbau* are given in the text by section numbers.

[2] The notion of a "theory of objects [*Gegendstandstheorie*]" refers to Meinong's *Gegend-*

standstheorie (§§3, 93, 172), which investigates all objects of thought as such. As Carnap explains: "The expression '*object* [*Gegenstand*]' is here used always in the widest sense, namely, for anything about which a statement can be made. Therefore we count among the objects not only things, but also properties and relationships, classes and relations, states and processes – moreover, the actual and the non-actual" (§1).

[3] Carnap expresses these qualms about the title of the *Aufbau* in correspondence with Reichenbach and Schlick in 1925–27. See Coffa (1991, note 11 to p. 231). I emphasize the importance of the physicalistic alternative for constitutional theory in Friedman (1987).

[4] And Mach, in turn, self-consciously places himself within the tradition of classical British empiricism. See, e.g., Mach (1986, chap. XV, §7): "By studying the physiology of the senses, and by reading Herbart, I then arrived at views akin to those of Hume, though at that time I was still unacquainted with Hume himself. To this very day I cannot help regarding Berkeley and Hume as far more logically consistent thinkers than Kant".

[5] Typical expressions of this conception are found in Quine and Goodman. Thus, according to Quine (1951, §5, p. 39): "[Carnap] 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". According to Goodman (1963, p. 558): "[The *Aufbau*] belongs very much in the main tradition of modern philosophy, and carries forward a little the efforts of the British Empiricists of the 18th Century".

[6] Quine (1969, p. 74) puts the point thus: "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".

[7] See Carnap (1963, pp. 13, 16). In Carnap's personal copy of *Our Knowledge of the External World*, at the end of the third chapter, where Russell speculates that his construction "can be obtained from more slender materials by the logical methods of which we shall have an example in the definitions of points, instants, and particles", Carnap wrote in the margin: "This narrowing and deepening of *the fundamental* postulates is my task!". See the introduction to Creath (1990, p. 24). Carnap's copy of Russell's book can be found in the Pittsburgh Archive for Scientific Philosophy.

[8] Carnap (1963, pp. 50, 57). I am indebted to Silvana Gambardella for emphasizing the importance of the second passage to me. This passage is also discussed in Creath (1982).

[9] See Quine (1951, p. 40; 1969, pp. 76–77). Carnap himself makes the same point in the preface to the second edition of the *Aufbau*: "Without myself being clearly conscious of it I in fact already went beyond the limits of explicit definition in the constitution of the physical world. For example, for the coordination of colors to space-time points (§127f.) only general principles were stated but not unambiguous [*eindeutige*] operational prescriptions". Technically speaking, the coordination of colors (later sensory qualities in general and then physical state magnitudes) to space-time points will fail to yield an explicit definition if in the hierarchy of types the procedure nowhere closes off at a definite rank. Since Carnap himself describes the procedure as subject to a complex process of continual revision (§135), it appears very likely that this last eventuality is indeed realized.

[10] When Carnap speaks of a "narrowing and deepening of [Russell's] *fundamental* postulates" in the margin of his copy of *Our Knowledge of the External World* (see note 7 above), it is quite possible that he has in mind not a more rigorous construction of the external world, but rather precisely the above construction of the purely autopsychological

domain. Indeed, in 1992, shortly after having first read Russell's book in 1921, Carnap wrote a manuscript, "Vom Chaos zur Wirklichkeit", largely devoted to a primitive version of this construction; at the top of the manuscript Carnap later wrote, "this is the germ for the constitutional theory of the 'Logischer Aufbau'" (document RC 081–05–01 in the Pittsburgh Archive for Scientific Philosophy – I am indebted to W. Gerald Heverly for providing me with a copy). Moreover, Carnap (1924) discusses the relationship between the "primary world" of immediately given sensations and the "secondary world" of physical objects; Carnap there deliberately leaves to one side the question of constructing the primary world itself from an "original chaos" as "a question of epistemology" (1924, p. 108). Finally, in the passage from *Our Knowledge of the External World* Carnap is commenting upon in his marginal note, Russell refers to the "logical methods" of the fourth chapter in which points, instants, and so on, are constructed as equivalence classes; Carnap refers explicitly to this chapter of Russell in developing his own technique of "quasi-analysis" in the *Aufbau* (§73).

[11] Carnap does employ this vocabulary (in Carnap 1928b; English translation by R. George in Carnap 1967). However, as Carnap makes clear in his preface to the English (second) edition of the *Aufbau*, Carnap (1928b) belongs to a different period of thought, after he had moved to Vienna (1926), and accordingly "shows a stronger influence of the Vienna discussions and Wittgenstein's book". By contrast, the *Aufbau* was written largely in the years 1922–25 (see Carnap 1963, pp. 16, 19–20).

[12] See especially §106:

> The content [of the constitutional system] depends on the contentful results of the [empirical] sciences – indeed, the lower levels in particular depend on the results of the phenomenology of perception and psychology. Since the results of these sciences are themselves still controversial, the thoroughgoing contentful correctness of their translation into the language of a constitutional system cannot be guaranteed.

[13] It is clear, moreover, that Carnap takes the order of epistemic primacy to be entirely uncontroversial. He assumes without comment, for example, that all epistemological "tendencies" will agree that

> all cognition traces back finally to my experiences, which are set into relation, connected, and worked up; thus cognition can attain in a logical progress to the various structures of my consciousness, then to the physical objects, further with their help to the structures of consciousness of other subjects and thus to the heteropsychological, and through the mediation of the heteropsychological to the cultural objects. (§178)

[14] As Howard Stein has pointed out to me, the original uses the example of the "hooded cobra [*Brillenschlage*]", which "is an animal that behind its head bears the figure of a bent pair of spectacles [*Brille*]". George's substitution nicely captures the duplication of words here.

[15] There is one passage in the discussion of indicators (§49) where Carnap uses more epistemically loaded vocabulary. He asserts that "for every scientific state of affairs there is in principle a *simultaneously infallible and never absent indicator* [*zugleich untrügliches und nie fehlendes Kennzeichen*]". However, he immediately explains the emphasized phrase thus "i.e., an indicator that is always then present, but also only then present, when the state of affairs is present". The rattles and the rattlesnake are then introduced

precisely to illustrate *this* relation. I am indebted to Alan Richardson for emphasizing the importance of this passage to me; he discusses it in some detail in Richardson (forthcoming).

[16] Carnap there says that the constitution of the world of physics, "neglecting the law-governedness which is to be introduced therein", is essentially determined through the physical-qualitative coordination. He alludes to the choice of a system of physics according to "the principle of simplicity" and explicitly refers to Carnap (1923) for further discussion of this choice. Compare also the list of possible systems of physics in §62 of the *Aufbau* with that in Carnap (1923, §III).

[17] In earlier characterizing the analogous "general rules of constitution" Carnap writes:

> These general rules can be designated as *a priori* rules, in so far as the constitution and the cognition of objects logically rests on them. . . . . The rules are not to be designated as "a priori cognition", however, for they present us not with cognitions, but rather *stipulations* [*Festsetzungen*]. In the actual cognitive-process these stipulations occur unconsciously. Even in scientific procedures they are seldom made consciously and explicitly. (§103)

[18] Carnap continues to hold, as noted above, that only the world of physics exhibits "an unambiguous [*eindeutig*] law-governedness of its processes". Since he now holds that statements about the world of physics *are* translatable into statements about the intermediate data of sense, how is this consistent with the argument of Carnap (1924) according to which the "primary world" fails to be law-governed precisely because the "secondary world" cannot be unambiguously translated into sensory terms? The answer is that Carnap is now working within Russell's theory of types. Although the physical world is translatable into sensory terms, the domain of the physical and the domain of the autopsychological still belong to entirely different "object-spheres" or logical types (§§30–31: all higher-level objects are classes of classes . . . of classes of elementary experiences). That the domain of the physical is unambiguously law-governed therefore does not imply that the domain of the autopsychological is as well. (In terms of note 9 above, however, translatability will nonetheless fail if the complex methodological procedure in question terminates at no definite rank in the hierarchy of types.)

[19] The non-empiricist character of Carnap's strategy stands out particularly clearly in Carnap (1923). Carnap there begins as follows:

> After a long time during which the question of the sources of physical cognition has been violently contested, it may perhaps already be said today that pure empiricism has lost its dominance. That the construction of physics cannot be based on experimental results alone, but must also apply non-empirical [*nichterfahrungsmäβig*] principles, has indeed been already proclaimed for a long time by philosophy. (1923, p. 90)

He then expounds the "conventionalism" of Poincaré and Dingler (§I). Finally, he characterizes the various axiomatic systems of physics as consisting of

> *synthetic a priori propositions*, however not exactly in the Kantian transcendental-critical sense. For this would mean that they express necessary conditions of the objects of experience, themselves conditioned by the forms of intuition and of thought. But

then there could be only *one* possible form for the content of [such a system]. In reality, however, its construction is left in many ways to our choice. (1923, p. 97)

[20] See Carnap (1950, §2). "Internal questions" *within* the "thing language", by contrast:

are to be answered by empirical investigations. Results of observations are evaluated according to certain rules as confirming or disconfirming evidence for possible answers. (This evaluation is usually carried out, of course, as a matter of habit rather than a deliberate, rational procedure. But it is possible, in a rational reconstruction, to lay down explicit rules for the evaluation. This is one of the main tasks of a pure, as distinguished from a psychological, epistemology.)

[21] The importance of this passage, together with other passages referring to neo-Kantianism considered below, has been rightly emphasized by Sauer. See the article referred to in note 1 above, and also Sauer (1985; 1987). My discussion throughout this section proceeds in very substantial agreement with Sauer; my disagreements with him will emerge in the following section. For a somewhat different perspective, see also Richardson (1992).

[22] Cassirer was the most important contemporary representative of the Marburg School of neo-Kantianism established by Hermann Cohen; of all the neo-Kantians he is clearly the one who is most attentive to recent developments in physics, mathematics, and logic. Rickert and Bauch belonged to the Southwest School of neo-Kantianism founded by Wilhelm Windelband. Rickert was Bauch's dissertation advisor at Freiburg (and Bauch dedicates his book to Rickert); Bauch, in turn, was Carnap's dissertation advisor at Jena (see Carnap 1963, pp. 4, 11–12). Some discussion of Bauch in relation to both Frege (his colleague at Jena) and Carnap can be found in Sluga (1980; the discussion of Carnap in particular occurs on pages 178–81 – although Sluga there incorrectly asserts that both Bauch and Frege directed Carnap's dissertation). It should be especially emphasized, finally, that when I speak of "neo-Kantian epistemology" in what follows I am limiting myself specifically to Cassirer, Rickert, and Bauch, who were undoubtedly the most important neo-Kantian influences on Carnap himself.

[23] See Lotze (1874, §§316–20). Lotze actually distinguishes three realms: things, which have "being [*Sein*]", events, which "happen [*geschehen*]", and propositions or relations between things, which have "validity [*Geltung*]". Rickert (1892, pp. 150–51) refers to Lotze (along with Brentano, Sigwart, Bergmann, and Windelband) as a forerunner of his conception of objective judgement. Bauch (1923, pp. 3–4, 240–41) refers to Lotze (along with Rickert) in this connection also. As both Rickert (1892, pp. 239n.) and Bauch (1923, pp. 11–12) point out, there is a close connection between these ideas and Meinong's *Gegendstandstheorie* (compare note 2 above).

[24] Bauch (1923, p. 133): "[*S*]*ie eingeordnet und eingestellt ist in einen Zusammenhang, eben den Zusammenhang objektiv-denknotwendiger Geltungsgesetzlichkeit*".

[25] This theme is particularly clear in Bauch, who views "the inclusion of sensation in the context of necessities of thought or laws of validity as presupposition of sensation itself [*die Einbezogenheit der Empfindung in den Zusammenhang denknotwendiger Geltungsgesetze als Voraussentzung der Empfindung selbst*]" (1923, p. 133).

[26] See §2:

Although the subjective starting point of all cognition lies in the contents of experience

> and their interconnections, it is still possible, as the construction of the constitutional system is to show, to arrive at an intersubjective, *objective world*, which is conceptually comprehensible – and, indeed, as an identical world for all subjects.

Burton Dreben has rightly emphasized to me that Carnap is here indebted to Russell's prior delineation of a closely related connection between logical structure and objectivity in the fourth chapter of Russell (1919) – as Carnap himself points out in §16.

[27] An additional important respect in which Carnap's procedure is essentially different from that of both Mach and Russell is that Carnap introduces space(-time) as a primitive, purely mathematical object (§122) and makes no attempt to construct space (as both Mach and Russell do) from sensory data. And this, moreover, explains why Carnap can dispense with both the sense-data of other people and with *sensibilia*: since all points of space are already given purely mathematically there is no need to construct "points of view" that neither I nor possibly anyone ever takes up (see §§3, 64, 124, 140). Yet it is ironic that the one respect in which Carnap thus "improves" on Russell's construction of the external world in fact distances the *Aufbau* even further from a strictly empiricist epistemology (here compare notes 7, 10, and 19 above).

[28] The first paragraph of §75, with its mention of the problem of "individuality", refers to a dispute between Rickert and Cassirer that is most relevant here. Rickert (1902) argues that, although the concepts of natural science indeed confer objectivity on what is sensibly given, they also inevitably result in a loss of individuality and immediate concreteness. The latter can only be comprehended by the quite different method of *historical* concept-formation. Cassirer (1910, chap. IV, §IX) then argues that logical-mathematical *relational* concepts are not vulnerable to Rickert's complaint; and it is this discussion of Cassirer to which Carnap is referring in his first paragraph of §75. In §12 Carnap points out, again referring to this discussion of Cassirer (and also to Rickert, Windelband, and Dilthey), that the desired "logic of individuality" can be attained precisely by the method of structural description.

[29] Again, the importance of this passage has been rightly emphasized by Sauer (compare note 21 above: see 1985, §III; 1989, §V).

[30] As noted above, there is no doubt that phenomenalist-empiricist motivations are explicitly expressed in the retrospective account of the *Aufbau* in Carnap (1963). We will return to these passages in Section 4 below.

[31] For the relation between this conception and (Machian) positivism see Carnap (1924, p. 109): "The positivistic philosophy, on the other hand, recognizes only the primary world; the secondary world is only an optional reorganization of the former, effected on grounds of economy".

[32] Thus, although the neo-Kantian tradition begins with sensations and then seeks to embed them in a logical-mathematical "context", the idea of a logical-mathematical *reduction* to the given is entirely foreign to this tradition. Indeed, although he enthusiastically accepts the new mathematical logic as a formal tool, Cassirer (1910, chap. II, §III, chap. III, §III) just as emphatically rejects the logicist reduction of mathematics and prefers instead the axiomatic or formalist conception associated with Hilbert. In this sense, Cassirer *rejects* Russell's "supreme maxim in scientific philosophizing".

[33] See the continuation of the passage from §160 quoted above: "[w]hether [the name of a quasi-object] nevertheless still designates something 'existing in itself [*an sich Bestehendes*]' is a question of metaphysics, which can have no place within science" (compare

§161 and §176). Compare also the discussion in Carnap (1924). Carnap there outlines two different answers to the question of which is the "real" world. Realism and (transcendental) idealism hold that the secondary world is "reality", while positivism limits "reality" to the primary world (note 31 above). Carnap (1924, pp. 109–10) then rejects the question:

> We leave aside this properly speaking transcendent question of metaphysics; our immanent account has only to do with the character of experience itself, in particular with the distinction of its form-factors into necessary and optional, which we call primary and secondary, and with the relations between the two types. Here the *expression 'fiction'* also bears no metaphysical-negative value-character, but means that in our construction certain form-factors are newly added: the construction takes place 'as if' these factors belonged necessarily to experience, as primary.

A similar rejection of "the metaphysical problem of reality" is found at the end of the manuscript "Vom Chaos zur Wirklichkeit" (note 10 above).

[34] For this reason, among others to be discussed below, Sauer (1985, §IV) finds it difficult to take seriously Carnap's attempt to distance himself from neo-Kantianism here.

[35] Rickert (1892, p. ix – from the preface to the third (1915) edition). In the fourth (1921) edition Rickert changes his terminology so that "being [*Sein*]" is now used comprehensively for both the real and the ideal realms. However, the "being and holding" terminology is used even in the fifth (1929) edition of Rickert (1902, see chap. III, §I). Cassirer uses the "being and holding" terminology in Cassirer (1910, chap. VII). Bauch employs a more complicated terminology involving a further distinction between "holding [*Geltung*]" and "validity [*Gültigkeit*]" (Bauch 1923, First Part, chap. II, §4). We observed above (note 23) that the "being and holding" terminology goes back to Lotze.

[36] The neo-Kantians characteristically take both Kant and Plato as models for their enterprise. For example, the introduction to Rickert (1892) asks that we "venture onto the difficult and thorny path of logic and epistemology taken by Plato and Kant". See also Bauch (1923, First Part, chap. IV, §5), and Cassirer (1910, chap. IV, §III, chap. VII, §I, chap. VIII, §I). Compare also the discussion of Plato in Lotze (1874, §§317–21).

[37] By the same token, the distinction between real and ideal objects is also reconstructed within the constitutional system via purely formal-logical devices (§§158, 170–74): it rests in the end on formal-logical properties of the spatial and temporal orderings (themselves constituted as just two more types of orderings within the constitutional system) that make them particularly useful "as principles of individuation and therefore also of actualization [*Wirklichkeitssetungen*] (which according to its meaning presupposes individuation)" (§158). In this way, the neo-Kantian ontological distinction between the real and the ideal is also logically deflated.

[38] George consistently translates "*Konstitution*" as "construction", so he is here forced to translate "*fiktiven Konstruktion*" as "fictitious constructive operation". Since, as I will argue momentarily, the "language of a fictional construction" turns out to be just the language of "transcendental idealism", George's translation obscures precisely the distinction between "constitution" and "generation in thought" that Carnap is attempting to maintain. Compare note 1 above.

[39] See Rickert (1892, chaps. III–IV). Rickert speaks of the "theoretical subject", the

"epistemological subject", the "judging subject", and "consciousness in general" rather than the "transcendental subject". In (1892, chap. IV, §§VI–VII) Rickert explicitly argues that "pure" logic is not sufficient to account for cognition; it must be supplemented precisely by "transcendental psychology". And this is also why Cassirer (1910, chap. VIII) feels compelled to add a final chapter on "the psychology of relations". Cassirer (1907, §IV) argues in the same vein that the merely "formal" logic of Russell and Couterat must be supplemented by "transcendental logic" in epistemology. Sauer (in 1985, §II; and 1989, §IV) seems to me to give insufficient weight to the circumstance that Cassirer's conception of logic thus involves an essentially psychological element while Carnap's involves no such element.

[40] See Carnap's discussion of the impact of Russell's book on him in 1921 (in Carnap 1963, p. 13). Russell's new conception of "the logical-analytic method of philosophy" is clearly the central point.

[41] Sauer (1985, §IV) explicitly rejects Carnap's claim to philosophical neutrality, arguing that Carnap is in fact committed either to neo-Kantian epistemology *simpliciter* or to (Machian) positivism. In particular, the only way in which Carnap can distance himself from neo-Kantian epistemology, according to Sauer, is by embracing a positivist conception on which "only the elementary experiences possess the character of reality" – a conception Sauer finds expressed in Carnap's claim that all objects except the elementary experiences are quasi-objects (§160). I have tried to show, on the contrary, how Carnap is otherwise distanced from neo-Kantian epistemology above (compare notes 34 and 39). Sauer's reading of §160 and Carnap's relation to positivist epistemology seem to me to be equally mistaken. For Carnap's notion of "reality" is also constructed *within* the constitutional system:

> In the same sense *the expression 'quasi-object' designates only a determinate logical relationship*, not the negation of a metaphysical reality-value. In fact all real objects (they are recognized in constitutional theory in the same sphere as real as in the [empirical] sciences, see §170) are quasi-objects.

(§52, compare notes 33 and 37 above)

[42] In this conception of the relationship between the *Aufbau* and neo-Kantianism I am especially indebted to discussions with Alan Richardson – which is not to say that he would fully agree with it of course. For his perspective on this issue, see Richardson (1992).

[43] Here I am again in very substantial agreement with Sauer (1989, §III). Richardson (forthcoming) provides an especially rich and detailed account of Carnap's early period; see also Richardson (1992).

[44] Carnap (1922, p. 67). An English translation by Michael Friedman and Peter Heath is forthcoming from Cambridge University Press.

[45] For the anti-empiricist character of Carnap's conventionalism of this period, compare again the passage from Carnap (1923) quoted in note 19 above. Sympathy with the Kantian conception of space (and time) is expressed as late as Carnap (1925, p. 231):

> The 'external world' surrounding us displays two types of order: that of succession [*Nacheinander*] and that of coexistence [*Nebeneinander*]. Since Kant we customarily answer the question of why every object of (outer) experience fits into these orders by

the idea that they are forms of intuition and therefore conditions to which every object must conform in order in general to be object of a possible experience.

[46] See note 31 above, and also Carnap (1924, p. 106): "The critique that has been exerted on the Kantian concept of experience, especially from the positivist side, has taught us that it is by no means the case that all form-factors in experience to which *Kant* ascribes necessity actually possess it".

[47] See Carnap (1924, pp. 106–07, 109–10), and compare note 33 above.

[48] This point, in particular, is well emphasized in Sauer (1989, p. 115). Sauer also suggests that Carnap's disagreement with neo-Kantianism here is more apparent than real since the Marburg School (Cassirer especially) was in fact willing to liberalize (i.e., *relativize*) the synthetic *a priori* and to admit alternative (e.g., non-Euclidean) experience-constituting structures. Sauer is of course perfectly correct with respect to the Marburg School, but the Southwest School of Rickert and Bauch was considerably more rigid. Rickert (1892, chap. V) defends the idea that only the spatio-temporal-causal (and presumably Euclidean) world of common sense can constitute "reality", while Bauch (1923, pp. 260–62) has to be convinced by Cassirer (1921) that non-Euclidean as well as Euclidean geometries could play an experience-constituting role. It is clear from the passage cited in note 46 above that Carnap has the more rigid (and thus more genuinely Kantian) versions of neo-Kantianism in mind here.

[49] Therefore I cannot follow Sauer (1989, p. 114) in the idea that "[Carnap's] doctrine of synthetic *a priori* forms of experience, however, he abandoned only after he had come to Vienna in 1926".

[50] Compare the discussion of conventions in the *Aufbau* in Section 1 above – particularly notes 17, 19, and 20. The problem of relating conventions, on the one hand, and the logic of *Principia Mathematica*, on the other, remains unsolved here, however. Although Carnap gestures towards a conventionalist conception of logic in §107 of the *Aufbau*, he is not able coherently to articulate such a conception until *Logische Syntax der Sprache* in 1934.

[51] See Carnap (1963, pp. 10–20). A revised version of the *Aufbau* was then published in 1928. It would of course be fascinating and most relevant here to compare the 1925–26 typescript with the published version. Unfortunately, it has so far proved impossible to locate a copy of the typescript – either in the Pittsburgh Archive for Scientific Philosophy, among Carnap's papers at the University of California at Los Angeles, or at the University of Vienna.

[52] See Haller (1985; 1991). See also the 'Introduction' to Frank (1949), and Kraft (1950; 1953). Kraft was an original member of Schlick's Philosophical Circle.

[53] See, for example, Frank (1949, p. 68).

[54] Schlick (1918) – clearly under the influence of his teacher Planck – sharply attacks Machian phenomenalism (together with Russell's external world program). However, Schlick's evolving assimilation of Einstein's general relativity theory led him progressively closer to Mach – particularly by 1921–22. For discussion see Friedman (1983).

[55] See Frank (1949, pp. 32–33). Of course the Vienna Circle was not established as an official society, under the rubric of the *Verein Ernst Mach*, until 1928).

[56] Very little evidence of such epistemological concerns is found in Mach, who instead tended to disavow all purely philosophical motivations and rest his case rather on the unity of science – the need, in particular, to unify physics and psychology. Moreover,

this is certainly how Philipp Frank (and presumably other members of the First Vienna Circle) read Mach (compare Frank 1949, chap. 3).

[57] Kraft (1953, pp. 32–33). Kraft (1953, pp. 30–31) attributes the origin of this conception – which of course leads naturally to the verifiability theory of meaning – to Wittgenstein. Interestingly enough, Kraft (1953, pp. 83–84) uses the very same conception of ultimately ostensive meaning to introduce his exposition of Carnap's constitutional system, whereas, as we know from Section 2 above, Carnap himself here explicitly rejects ostension as a source of meaning (see §§13, 16). Kraft is not unaware of this circumstance, and he handles the conflict by distinguishing between *subjective* meaning based on ostension and *intersubjective* meaning based on logical structure (1953, p. 84). But the important point is that Kraft's notion of *subjective* meaning is entirely foreign to the *Aufbau*.

[58] Waismann's *Theses* (circa 1930), which purports to summarize the *Tractatus*, explicitly articulates this conception in §7, on 'Definition' (see Waismann 1979, pp. 246–53). Schlick puts forward essentially the same argument in virtually all of his papers from the early 1930s (for discussion see Friedman 1983).

[59] Again, see Kraft (1953, pp. 114–17, especially p. 117):

> Wittgenstein identified [atomic propositions] with the propositions he called 'elementary propositions.' They are propositions which can be *immediately* compared with reality, i.e., with the data of experience. Such propositions must exist, for otherwise language would be unrelated to reality. All propositions which are not themselves elementary propositions are necessarily truth-functions of elementary propositions. Hence all empirical propositions must be reducible to propositions about the given . . . . The reduction is made possible by a family-tree of concepts which exhibits their reducibility to relations between experiences, the sort of reduction sketched in Carnap's constitution-system. In this way the empiricist theories of meaning, concepts and propositions are all interconnected.

Although there is a suggestion of the verifiability theory of meaning in §179 of the *Aufbau*, I am tempted to conjecture that this section was written after Carnap came to Vienna. Unfortunately, I am not in a position to verify this conjecture (see note 51 above).

[60] The writings I have in mind here are Carnap (1928b; 1930; 1932a; 1932b; 1932c; 1932d).

[61] See Carnap (1932a, §2), and compare Carnap (1928, Part I, §A.1). On ostension see Carnap (1932b, §2), which asserts – contrary to the usual conception – that ostensive definitions involve translation *within* language just as much as do nominal definitions.

[62] See Carnap (1932a, §2; 1932b, §3).

[63] See Carnap (1932b, §3): "The simplest sentences of the *protocol language* are the protocol sentences, i.e., sentences which do not themselves require confirmation [*Bewährung*] but serve as basis [*Grundlage*] for all other sentences of science". It is clear from the context, I think, that the sense in which protocol sentences do not *require* confirmation is simply that their truth or falsity is not in fact at issue in the procedures of scientific testing Carnap aims here rationally to reconstruct. See also Carnap (1932c, §7): "The difference [between a "system sentence" – i.e., a scientifically testable sentence – and a protocol sentence] rests on the fact that the system sentence . . . may, under certain circumstances, be disavowed, whereas a protocol sentence, being an epistemological

point of departure, cannot be rejected". Again, the sense in which a protocol sentence *cannot* be rejected is simply that such sentences are not in fact at issue in the relevant process of testing.

[64] Carnap (1930, §8); see also Carnap (1932b, §7); and compare §§133 and 136 of the *Aufbau*. With respect to the issue raised in note 63 above, it should be pointed out that Levi's translation of our passage from Carnap (1930) misleadingly suggests that Carnap has a more traditionally foundationalist conception of epistemic justification in mind. For Levi renders the fourth sentence thus: "The positivist conception corresponds to the epistemological viewpoint because it proves the validity of knowledge by reduction to the given". As I read Carnap here he is saying that, just as in the constitutional system of the *Aufbau*, the point of the positivistic system is simply to display – rationally to reconstruct – the epistemological justification or validity that a cognition *already has* in virtue of its place in the system of the sciences.

[65] Carnap (1932d, §3). The point is that once protocol sentences are translated into the physical language they no longer have even the "refined" epistemic privilege of note 63 above.

[66] This point is especially well brought out in Richardson (forthcoming), via a discussion of the important transitional paper Carnap (1936).

REFERENCES

Ayer, A. J. (ed.): 1959, *Logical Positivism*, The Free Press, Glencoe, IL.

Bauch, Bruno: 1923, *Wahrheit, Wert und Wirklichkeit*, Felix Meiner Verlag, Leipzig.

Carnap, Rudolf: 1922, *Der Raum. Ein Beitrag zur Wissenschaftslehre*, Kant-Studien Ergänzungsheft Nr. 56, Reuther & Reichard, Berlin.

Carnap, Rudolf: 1923, 'Über die Aufgabe der Physik und die Anwendung des Grundsatzes der Einfachstheit', *Kant-Studien* **28**, 90–107.

Carnap, Rudolf: 1924, 'Dreidimensionalität des Raumes und Kausalität', *Annalen der Philosophie und philosophischen Kritik* **4**, 105–30.

Carnap, Rudolf: 1925, 'Über die Abhängigkeit der Eigenschaften des Raumes von denen der Zeit', *Kant-Studien* **30**, 331–45.

Carnap, Rudolf: 1928a, *Der logische Aufbau der Welt*, Weltkreis-Verlag, Berlin (1961, 2nd ed., Felix Meiner Verlag, Hamburg).

Carnap, Rudolf: 1928b, *Scheinprobleme in der Philosophie*, Weltkreis-Verlag, Berlin.

Carnap, Rudolf: 1930, 'Die alte und die neue Logik', *Erkenntnis* **1**, 12–26 (1959, 'The Old and the New Logic', in Ayer, trans. by I. Levi, pp. 133–46).

Carnap, Rudolf: 1932a, 'Überwindung der Metaphysik durch logische Analyse der Sprache', *Erkenntnis* **2**, 219–41 (1959, 'The Elimination of Metaphysics through Logical Analysis of Language', in Ayer, trans. by A. Pap, pp. 60–81).

Carnap, Rudolf: 1932b, 'Die physikalische Sprache als Universalsprache der Wissenschaft', *Erkenntnis* **2**, 432–65 (1934, *The Unity of Science*, trans. by M. Black, Kegan Paul, London).

Carnap, Rudolf: 1932c, 'Psychologie in physikalischer Sprache', *Erkenntnis* **3**, 107–42 (1959, 'Psychology in Physical Language', in Ayer, trans. by G. Schick, pp. 165–98).

Carnap, Rudolf: 1932d, 'Über Protokollsätze', *Erkenntnis* **3**, 215–28 (1987, 'On Protocol Sentences', *Noûs* **21**, 457–70).

Carnap, Rudolf: 1936, 'Von der Erkenntnistheorie zur Wissenschaftslogik', in *Actes du Congrès international de philosophie scientifique, Sorbonne, Paris, 1935, 1. Philosophie scientifique et empirisme logique*, Hermann & C^{ie}, Paris, pp. 36–41.

Carnap, Rudolf: 1950, 'Empiricism, Semantics, and Ontology', *Revue Internationale de Philosophie* **11**, 20–40 (reprinted in 1956, *Meaning and Necessity*, 2nd enlarged ed., University of Chicago Press, Chicago and London).

Carnap, Rudolf: 1963, 'Intellectual Autobiography', in P. Schlipp (ed.), *The Philosophy of Rudolf Carnap*, Open Court, La Salle, IL, pp. 3–48.

Carnap, Rudolf: 1967, *The Logical Structure of the World & Pseudoproblems in Philosophy*, trans. by R. George, University of California Press, Berkeley and Los Angeles.

Cassirer, Ernst: 1907, 'Kant und die moderne Mathematik', *Kant-Studien* **12**, 1–49.

Cassirer, Ernst: 1910, *Substanzbegriff und Funktionsbegriff*, Bruno Cassirer, Berlin.

Cassirer, Ernst: 1921, *Zur Einsteinschen Relativitätstheorie*, Bruno Cassirer, Berlin.

Cassirer, Ernst: 1923, *Substance and Function, and Einstein's Theory of Relativity*, trans. by W. Swabey and M. Swabey, Open Court, Chicago and London).

Coffa, Alberto: 1991, *The Semantic Tradition from Kant to Carnap: To the Vienna Station*, Cambridge University Press, Cambridge.

Creath, Richard: 1982, 'Was Carnap a Complete Verificationist in the *Aufbau*?', *PSA 1982* **1**, 384–93.

Creath, Richard: 1990, *Dear Carnap, Dear Van: The Quine–Carnap Correspondence and Related Work*, University of California Press, Berkeley and Los Angeles.

Frank, Philipp: 1949, *Modern Science and its Philosophy*, Harvard University Press, Cambridge, MA.

Friedman, Michael: 1983, 'Moritz Schlick's *Philosophical Papers*', *Philosophy of Science* **50**, 498–514.

Friedman, Michael: 1987, 'Carnap's *Aufbau* Reconsidered', *Noûs* **21**, 521–45.

Goodman, Nelson: 1963, 'The Significance of *Der logische Aufbau der Welt*', in P. Schilpp (1963), pp. 545–58.

Haller, Rudolf: 1985, 'Der erste Wiener Kreis', in *Epistemology, Methodology and Philosophy of Science. Essays in Honor of C. G. Hempel on the Occasion of His 80th Birthday, January 8, 1985, Erkenntnis* **22**, 341–58.

Haller, Rudolf: 1991, 'The First Vienna Circle', in T. Uebel (ed. and trans.), *Rediscovering the Forgotten Vienna Circle*, Kluwer, Dordrecht, pp. 95–108.

Kraft, Viktor: 1950, *Der Wiener Kreis*, Springer-Verlag, Vienna.

Kraft, Viktor: 1953, *The Vienna Circle*, trans. by A. Pap, Philosophical Library, New York.

Lotze, Hermann: 1874, *Logik*, S. Hirzel, Leipzig (1884, *Logic*, trans. by B. Bosanquet, Oxford University Press, Oxford).

Mach, Ernst: 1886, *Beiträge zur Analyse der Empfindungen*, Gustav Fischer, Jena (reprint: 1959, *The Analysis of Sensations*, trans. by C. M. Williams, Dover Publications, New York).

Quine, Willard van Orman: 1951, 'Two Dogmas of Empiricism', *The Philosophical Review* **60**, 20–43 (reprinted: 1963, *From a Logical Point of View*, Harper, New York).

Quine, Willard van Orman: 1969, 'Epistemology Naturalized', in *Ontological Relativity and Other Essays*, Columbia University Press, New York.

Richardson, Alan: 1992, 'Logical Idealism and Carnap's Construction of the World', *Synthese*, this issue.

Richardson, Alan: forthcoming, *Carnap's Construction of the World: The* Aufbau *and the Emergence of Logical Empiricism*, Cambridge University Press, Cambridge.
Rickert, Heinrich: 1892, *Der Gegenstand der Erkenntnis*, Druck von C. A. Wagner, Frieburg i. B. (1921, 5th ed., J. C. B. Mohr, Tübingen).
Rickert, Heinrich: 1902, *Die Grenzen der naturwissenschaftlichen Begriffsbildung*, J. C. B. Mohr, Tübingen (1986, *The Limits of Concept Formation in Natural Science*, trans. (partially) by G. Oakes, Cambridge University Press, Cambridge).
Russell, Bertrand: 1914, *Our Knowledge of the External World as a Field for Scientific Method in Philosophy*, George Allen & Unwin, London.
Russell, Bertrand: 1919, *Introduction to Mathematical Philosophy*, George Allen & Unwin, London.
Sauer, Werner: 1985, 'Carnaps "Aufbau" in Kantianischer Sicht', *Grazer Philosophische Studien* **23**, 19–35.
Sauer, Werner: 1985, 'Carnaps Konstitutionstheorie und das Program der Einheitswissenschaft des Wiener Kreises', *Conceptus* **21**, 233–45.
Sauer, Werner: 1989, 'On the Kantian Background of Neopositivism', *Topoi* **8**, 111–19.
Schilpp, P. (ed.): 1963, *The Philosophy of Rudolf Carnap*, Open Court, La Salle, IL.
Schlick, Moritz: 1918, *Allgemeine Erkenntnislehre*, Naturwissenschaftliche Monographien und Lehrbücher I, Julius Springer, Berlin (1985, *General Theory of Knowledge*, trans. by A. Blumberg, Open Court, La Salle, IL).
Schlick, Moritz: 1934, 'Über das Fundament der Erkenntnis', *Erkenntnis* **4**, 79–99 (1979, 'On the Foundation of Knowledge', in H. Mulder and B. van de Velde-Schlick (eds.), *Moritz Schlick: Philosophical Papers*, trans. by P. Heath, Vol. II, D. Reidel, Dordrecht, pp. 370–87).
Sluga, Hans: 1980, *Gottlob Frege*, Routledge, Boston, London and Henley.
Waismann, Friedrich: 1979, *Wittgenstein and the Vienna Circle*, ed. by B. McGuinness, Basil Blackwell, London.

Department of Philosophy (m/c 267)
University of Illinois at Chicago
Chicago, IL 60680
U.S.A.