

Phenomenological Elements in Carnap's Aufbau: the Epistemological Role of Sensible Intuition

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The Carnap of Der logische Aufbau der Welt was aware of the problem of "imperfect community." Nonetheless he ignores it. We argue that Carnap's tendency to downplay this difficulty is best understood in light of the enduring influence of Husserlian phenomenology on his early philosophy. On this reading, the Aufbau preserves an epistemological framework partially grounded in the structures of subjective experience, already at the heart of Der Raum.

Keywords: Rudolf Carnap; Aufbau; Structural Empiricism; Sensible Intuition; Quasi-Analysis.

1. Introduction

Rudolf Carnap's first major work is *Der Logische Aufbau der Welt* (*The Logical Structure of the World*, hereafter *Aufbau*)¹. This seminal text has generated extensive debate and diverse interpretations. In this paper, we propose a novel reading of *Aufbau* through the lens of "structural empiricism," an epistemological position that emphasizes the formative role of experiential structures in knowledge without grounding justification solely in empirical data. Our central claim is that Carnap, in his attempt to outline a general constructive system via the method of "quasi-analysis," anticipates this position. By emphasizing the structural organization of experience, particularly through the notion of recollection of partial similarities, Carnap offers a sophisticated response to the problem of the relation between logic and experience. We define structural empiricism as a view characterized by two key principles:

- The primacy of structural features of experience in shaping epistemic justification.
- The impossibility of justifying propositions through intuition, despite its necessary role from an epistemological point of view.

A conceptual parallel to this approach is found in Angelucci,² who emphasizes the distinction between the state of being justified in holding a belief and the activity of *justifying a belief*. This distinction suggests that philosophical reasoning frequently draws on intuitive or experiential structures rather than formal inferential justification. Stegmüller³ similarly highlights the epistemological role of self-evidence (*Evidenz*), treating it as a subjective but indispensable dimension of reasoning, particularly in mathematics and philosophy. This paper argues that *Aufbau* implicitly aligns with this epistemological stance. While drawing from empiricism, Kantianism, and Phenomenology, Carnap's project defies reduction to any single tradition. Instead, it presents an original and nuanced synthesis that privileges structured experience without appealing to metaphysical foundations. Understanding science from Carnap's perspective requires conceptualizing knowledge through auto-psychological experience, even though such experience cannot be the direct object of scientific inquiry.⁴ Only through the logical construction

1 - R. Carnap, *The Logical Structure of the World*, University of California Press, Berkeley 1967.

2 - A. Angelucci, *On Justifying Case Verdicts. A Dialectical Hypothesis*, in «Inquiry», 68 (2022), n. 2, pp. 297-317.

3 - W. Stegmüller, *Metaphysik Skepsis Wissenschaft*, Springer-Verlag, Berlin 2013

4 - Although the present paper engages with the historical background of Carnap's early thought, our aim is primarily philosophical rather than strictly historiographical. We do not claim that the interpretive the-

of empirical constituents can abstract scientific concepts be rendered intelligible. The epistemological interpretation we propose also addresses some historical critiques of Carnap's project, most notably those by Nelson Goodman⁵ and Quine.⁶ Goodman questioned the logical adequacy of the quasi-analysis method, particularly its reliance on similarity relations, while Quine challenged the possibility of reducing physical-object language to a sensory base. Although we explore these objections in detail in Section 5, it is important to flag them early on, as they have shaped much of the secondary literature's skepticism toward the *Aufbau*. Our reinterpretation of Carnap's method as structurally empiricist offers a way to answer these critiques without abandoning the core insights of his constructional system. The structure of this paper is as follows: Section 2 introduces the framework of structural empiricism through the works of Angelucci and Stegmüller. Section 3 examines the main philosophical influences on *Aufbau*. Section 4 analyzes the internal mechanics of Carnap's quasi-analysis. Section 5 discusses the rehabilitations of *Aufbau* by Leitgeb and Mormann. Section 6 concludes by arguing that Carnap's young project is best understood through the epistemological lens of structural empiricism.

2. Structural Empiricism

Before discussing the interpretation of Carnap's work, it is necessary to define what we mean by structural empiricism. This position can be clarified by reference to Adriano Angelucci's *On Justifying Case Verdicts: A Dialectical Hypothesis*.

They develop a dialectical hypothesis analyzing the method of cases (hereafter MOC) in philosophical theorizing⁷. MOC is a technique in which philosophers examine specific scenarios to explore philosophical problems. Characteristically, this technique involves an appeal to intuition, where "a case is typically taken as decisive in supporting or undermining a given theory (thesis, or analysis) in virtue of a certain proposition purportedly holding true of it"⁸. Angelucci presents a decisive

ses advanced here apply to Carnap's work as a whole, nor that they capture his later views in logical empiricism. Rather, the claims developed in this paper are intended to apply, at most, to *Der logische Aufbau der Welt* and to the specific epistemological framework articulated therein.

5 - N. Goodman, *The Structure of Appearance*, Bobbs-Merrill, Indianapolis 1966.

6 - W.V.O. Quine, *Two Dogmas of Empiricism*, in «The Philosophical Review», 60 (1951), pp. 20-43.

7 - E. Machery, *Philosophy Within Its Proper Bounds*, Oxford University Press, Oxford 2017.

8 - A. Angelucci, *On Justifying Case Verdicts. A Dialectical Hypothesis*, in «Inquiry», 68 (2022), n. 2, p. 2.

challenge to the arguments of Deutsch⁹ and Cappelen¹⁰, who claim that when philosophers argue for their case verdicts, they always provide reasons for accepting them. This supports the view that philosophers do not regard intuitions as their justificatory source, a view known as the *Argument View*. Angelucci does not dispute that philosophers offer arguments. However, they argue that this alone is insufficient to conclude that these arguments are regarded as sources of justification tout court. Instead, Angelucci proposes a meaningful distinction between the activity of “justifying a belief” and the state of “being justified in holding a belief.” According to the Argument View, philosophers provide arguments as reasons for their beliefs, which constitute evidence or justification. As Deutsch puts it,

In general, if one gives an explicit argument for p and does no more by way of indicating why p ought to be accepted, then one can be taken as having provided what one takes to be the justification or evidence for p¹¹.

Arguing for one's beliefs, therefore, is typically interpreted as offering reasons as the main justification. However, in epistemology, a key distinction exists between being justified in holding a belief (a state) and justifying that belief (an activity). The former concerns one's current epistemic position, while the latter refers to a potentially fallible process of reason-giving. According to Angelucci, this distinction is crucial to understanding MOC because “justifying a given belief is not always perceived as a necessary condition for being justified in holding it; at times, that is, reason-giving is not seen as required for justification”¹². This observation undermines the Argument View, suggesting that while philosophers may offer arguments, they do not necessarily regard them as the justificatory basis for their beliefs. Instead, their justification may rest on other grounds. Argumentation can serve dialectical purposes, aimed at persuasion or consensus-building, rather than providing the epistemic foundation for belief. This perspective allows for an interpretation of MOC that accommodates the idea that intuitions remain a component of justification. Thus, Angelucci contends that philosophers employing MOC may not treat their stated reasons as justificatory sources but continue to hold beliefs accompanied by intuitive states. These beliefs may align with

9 - M. Deutsch, *Experimental Philosophy and the Theory of Reference*, in «Mind and Language», 24 (2009), n. 4, pp. 445-466.

10 - H. Cappelen, *Philosophy Without Intuitions*, Oxford University Press, Oxford 2012.

11 - M. Deutsch, *Gettier's Method*, in J. Nado (ed.), *Advances in Experimental Philosophy and Philosophical Methodology*, Bloomsbury Academic, New York 2016, p.74.

12 - A. Angelucci, *On Justifying Case Verdicts. A Dialectical Hypothesis*, in «Inquiry», 68 (2022), n. 2, p. 7.

prevailing views¹³ and need not always be explicitly justified. Philosophical justification, in this case, becomes a dialectical act aimed at fostering agreement, rather than demonstrating formal proof. It is true that a thesis cannot be justified solely by an appeal to intuition, but it is also true that intuitions cannot be eliminated from the reasons for holding a thesis. While fallible, these processes still retain cognitive value.

Although Angelucci's argument suggests that intuition plays a role as a source of justification, our claim is somewhat more moderate. We maintain that intuition cannot be employed in the process of justifying something, as it cannot be falsified; however, intuition remains essential to the process of knowledge, and for that reason, it is indispensable. Consider, for example, a simple auditory scenario with three tones: A, B, and C. Tones A and B share a similar timbre. In contrast, A and C share the same pitch, and finally, C and B have no evident equivalence. Even in this context, the human brain can immediately recognize the similarity in frequency between B and C without needing to resort to the whole equivalence class. Our auditory system is capable of capturing directly patterns and universals, often from a single situation, highlighting the immediacy of sensory recognition. This phenomenon mirrors Brentano's idea that induction can arise from a single case, which gives intuition a crucial epistemological role without relying on the necessity of multiple experiences.¹⁴ A paradigmatic case is touching the fire with a hand; right after the first experience, we can say that fire will hurt us. Similarly, in visual perception, encountering only a few chairs may be sufficient to apprehend the general category of "chair" or its archetypal form. These examples illustrate how justification can be grounded in immediate, single-case experiences rather than in large classes of repeated instances for recognition and full demonstration. To better understand the point raised by Angelucci, it is helpful to consider another scholar who contributes to the epistemological foundation of structural empiricism and who also grants significant importance to intuition: Stegmüller.¹⁵ In his work, they examine the epistemological function of self-evidence (*Evidenz*), highlighting that this concept resists rigorous definition. According to Stegmüller, self-evidence cannot be captured through an exhaustive formula but must instead be illustrated with concrete examples. This suggests that evidence should be understood more as a phenomenological experience than as a formalizable concept. Despite these limitations, Stegmüller insists that self-evidence is indispensable in knowledge practices. It arises in diverse contexts, including sensory perception, mathematical

13 - With the prevailing view, we intend the most dominant position.

14 - F. Brentano, *Psychologie vom empirischen Standpunkt*, Duncker & Humblot, Leipzig 1874.

15 - W. Stegmüller, *Metaphysik Skepsis Wissenschaft*, Springer-Verlag, Berlin 2013.

proof, and philosophical argumentation. In each of these domains, we frequently rely on what strikes us as "evident." A paradigmatic example is found in mathematics. When subject A explains a proof to subject B, A cannot justify a step merely by stating, "this step is self-evident." Nevertheless, A will often depend on B's intuitions, guiding them toward a direct, immediate grasp of the reasoning's validity. The structural empiricism proposed by Angelucci and Stegmüller reframes the role of intuition not as a substitute for rigorous argumentation, but as a complementary and empirically grounded source for belief formations. Intuition, in this view, plays a valuable epistemic role in shaping our judgments and conceptual frameworks. The notion of intuition in structural empiricism is analogous to the "logic of discovery", as articulated by Lakatos in *Proofs and Refutations: The Logic of Mathematical Discovery*.¹⁶ According to Lakatos, this process is not purely deductive, but it involves heuristic and intuitive insights that guide the development of mathematical concepts and proofs. Similarly, in structural empiricism, intuition does not serve as a basis for inferential justification but plays a role in shaping the structure of experience and enabling scientific abstraction. For this reason, we argue that the role of intuition is local rather than global: it cannot be dismissed, yet it does not function as a source of justification in the strict sense, as Angelucci rightly emphasizes. Nonetheless, it remains a crucial part of the epistemological process. What we have in mind is illustrated in cases of analogical reasoning. For instance,

In the case of the Euler characteristic formula, experience may suggest to us that a rigorous proof for the three-dimensional case will almost certainly involve removing and adding vertices, edges, and faces. In all such cases, broadly speaking, we retain the basic intuition that the analogy exhibits reasonable potential for generalization. If we decide to persist with the analogy, then our model provides clear guidance about how it may be restricted or reformulated in order to meet our criteria of plausibility.¹⁷

Bartha analyzes how analogies can motivate generalizations and conjectures about explanatory principles. He highlights that the role of analogy is not only a tool for illustrating facts, but it also helps to formulate open questions and guide the direction of research. This generative aspect is captured in what Bartha calls the plausibility argument: analogies may justify tentative intuitions about the applicability of a model, even in the absence of complete theoretical or empirical

¹⁶ - I. Lakatos, *Proofs and Refutations: The Logic of Mathematical Discovery*, Cambridge University Press, Cambridge 1976.

¹⁷ - P. Bartha, *By Parallel Reasoning: The Construction and Evaluation of Analogical Arguments*, Oxford University Press, Oxford 2010, p.198.

support. This interplay between analogy and intuition becomes even more significant when expert knowledge is involved. In these situations, intuition plays a unique role in the reasoning process. Although expert intuition can be fallible, it helps identify significant structural similarities and modal constraints that extend beyond superficial appearances¹⁸. This kind of expert-guided intuition reflects the structural features of experience that structural empiricism aims to emphasize: not as a basis for formal justification, but as a necessary component in the discovery and formation of scientific concepts.

3. The influences of Carnap's philosophy

The main goal of this paper is to show that the epistemological position outlined in the previous section closely resembles Carnap's proposal of quasi-analysis. However, this perspective significantly differs from the three main philosophical positions that influenced Carnap's *Aufbau*. In this section, we briefly discuss and compare these positions with structural empiricism, highlighting also the key differences that emerge from Carnap's view. The first position to consider is empiricism. According to this view, all knowledge is derived from sensory experience. It rejects the notion of innate ideas or a priori knowledge independent of perception. Mental representations or scientific notions are considered generalizations formulated from data provided by the senses. Within this framework, any theoretical construction lacks absolute truth and is instead regarded as a useful convention for organizing and simplifying our experience of the world. This position is championed by Ernst Mach,¹⁹ the Austrian physicist and philosopher who had a profound influence on Carnap and is frequently cited by him. Mach believed that science should remain rooted in the immediacy of sensory experience. Scientific concepts, he argued, should serve merely as tools for organizing perceptions rather than as representations of metaphysical entities. As Coffa notes in the analysis of Mach's thoughts: "The truth in science was entirely a matter of sense and sensibility, and the farther science went in the direction of insensible human postulation, the farther it departed from truth and reality".²⁰

Empiricism thus aims to identify the invariants in experience, those regularities that recur and can be described by natural laws. Yet, it grants no epistemological

18 - For a detailed discussion of the role of expert intuition in analogical reasoning, see Chapters 5 and 6 of Bartha.

19 - E. Mach, *The Analysis of Sensations, and the Relation of the Physical to the Psychical*, Open Court Publishing Company, La Salle 1914.

20 - A. Coffa, *The Semantic Tradition from Kant to Carnap: To the Vienna Station*, edited by L. Wessels, Cambridge University Press, New York 1991, p.191.

weight to subjective understanding. Theories do not explain reality "in itself" but provide a pragmatic and economical means of describing observations. Empiricism denies the possibility of grounding knowledge in principles independent of observation. Science, for empiricism, does not uncover ultimate truths but constructs effective models to navigate the complexity of the phenomenal world. As Carus notes in this framework: "it was pretty much taken for granted that subjectivity is, ultimately, part of nature, of which science gives us a larger and more systematic picture than any individual's collection of subjective experiences".²¹ By contrast, structural empiricism maintains that there are structures within our experience, such as intuitions and self-evidence, that play a crucial role in our theorizing. These structures constrain and, in a sense, define the theories we build. Before examining another philosophical position that shaped Carnap's thought, a key distinction must first be drawn. In the phenomenological tradition, two kinds of intuition are usually distinguished: apodictic and assertoric evidence. This classification originates in Franz Brentano's *Psychologie vom empirischen Standpunkte*²². The kind of intuition that concerns us in structural empiricism, and that plays a decisive role in shaping the structure of experience, is the apodictic one. Brentano illustrates what he calls *apodiktisch Urteil* with the following example:

If someone says the impossibility of a round square exists someone who carelessly heeds only the grammatical form may think that he is affirming something, while in fact he is negating something, since he is apodictically denying the round square. In so doing he is thinking about the round and the square and in both cases the reference has a thing as its object²³.

Apodictic intuition does not merely present a proposition as evidently true; it also reveals the impossibility of its negation, in a form of phenomenological necessity. It must be regarded as a pre-theoretical certainty that informs how experience is structured and how objects are constituted at the level of experience. By contrast, intuitions are not to be understood in the sense of what Brentano called *assertorisch Urteil*:

All men are mortal.' This proposition, therefore, seems to affirm the conjunction of man and mortal, only on the assumption that a man exists. Yet a glance at the existential proposition which is equivalent to the categorical

21 - A. W. Carus, *Carnap and Phenomenology: What Happened in 1924?*, in C. Damböck (ed.), *Influences on the Aufbau*, Springer, Berlin 2016, pp. 159-186.

22 - F. Brentano, *Psychologie vom empirischen Standpunkt*, Duncker & Humblot, Leipzig 1874.

23 - F. Brentano, *Psychology from an Empirical Standpoint*, edited by O. Kraus and translated by L.L. McAlister, Routledge, New York 1995, p. 252.

proposition solves the whole difficulty. It shows that the proposition is not really an affirmation, but a denial.²⁴

Assertoric evidence provides factual certainty but offers no further new information.²⁵ This evidence can be used in scientific reasoning, but it does not play the structural or constitutive role that the apodictic intuition has in capturing the framework of knowledge. In structural empiricism, we do not claim that intuition justifies empirical propositions inferentially; instead, apodictic evidence functions as the form of intuition that structures experience and enables scientific abstraction. As Stegmüller observes, it is a fundamental component of knowledge, even though its existence cannot be demonstrated directly.

The next step is to examine another philosophical position that influenced Carnap, namely that of Edmund Husserl.²⁶ Carnap explicitly acknowledges this influence in his 1922 thesis *Der Raum*,²⁷ particularly when defining intuitive space. He writes:

Experience does not supply the justification for them; the axioms are independent of experience. More precisely, they are independent of the 'quantity of experience' (as Driesch puts it), i.e., knowledge of them does not, as in the case of empirical statements, become progressively more secure with repeated experience. For as Husserl has shown, this is not a question of facts in the sense of empirical reality, but rather a question of the essence (*eidos*) of certain items given to us, an essence that can be immediately grasped in its particular character even from a single instance.²⁸

This deep connection between Husserl and Carnap has been highlighted by many scholars. Carus,²⁹ for example, characterizes the pre-1924 Carnap as a kind of "young Husserlian Carnap," emphasizing the extent to which his thinking was shaped by Husserl's phenomenology, critique of empirical psychology, and the method of constitution. A central feature of Husserl's phenomenology is the

24 - F. Brentano, *Psychology from an Empirical Standpoint*, edited by O. Kraus and translated by L.L. McAlister, Routledge, New York 1995, p.167.

25 - V. Fano, *La filosofia dell'evidenza. Saggio sull'epistemologia di Franz Brentano*, CLUEB, Bologna 1993.

26 - M. Hartimo, *Rudolf Carnap* (1891-1970), in *Encyclopedia of Phenomenology*, 2025.

27 - R. Carnap, *Early Writings*, edited by A. W. Carus, M. Friedman, W. Kienzler, A. Richardson and S. Schlotter, general editor R. Creath, Oxford University Press, New York 2019.

28 - *Ibid.*, 55.

29 - A. W. Carus, *Carnap and Phenomenology: What Happened in 1924?*, in C. Damböck (ed.), *Influences on the Aufbau*, Springer, Berlin 2016, pp. 159-186.

rehabilitation of the synthetic *a priori* in a new form, which he calls "material." This concept is introduced in the *Logische Untersuchungen*³⁰:

Each pure law, which includes material concepts, so as not to permit of a formalization of these concepts *salva veritate* - each such law, i.e., that is not analytically necessary - is a *synthetic a priori law*. Specifications of such laws are synthetic necessities: empirical specifications of course are so also, e.g. *This red is different from this green*³¹.

This idea is further developed in *Erfahrung und Urteil*,³² where Husserl argues that the material *a priori* is a general intuition intrinsic to experience. The goal of Husserl's phenomenology is to construct a foundational science based on this material *a priori*, which would underlie all other sciences. Structural empiricism, however, diverges here. It holds that experiences can never justify a sentence; at most, one may be justified in maintaining a belief because of a specific experience. The crucial point is that the process of holding a belief does not represent any inferential process but maintains its indispensability in the process of justification of a sentence. As a consequence, intuitions have an epistemological key role in the process of justification, but they cannot be taken as part of the inferential process. Therefore, intuitions play a key epistemological role in the justification process, but they cannot be regarded as part of the inferential process.

Finally, Carnap was also influenced by Neo-Kantianism.³³ Neo-Kantian thinkers such as Cassirer, Natorp, and Rickert are cited throughout the *Aufbau*, and Carnap attended the lectures of the Neo-Kantian philosopher Bruno Bauch in Jena. Both Natorp and Cassirer played crucial roles in shaping Carnap's *Der Raum*, as Fano³⁴ has shown. In his *Autobiography*,³⁵ Carnap later writes:

Formal space is an abstract system, constructed in mathematics, and more precisely in the logic of relations; therefore, our knowledge of formal space is of a logical nature. Knowledge of intuitive space I regarded at that time, under the

30 - E. Husserl, *Logical Investigations*. Volume 2, edited by D. Moran, Routledge, New York 2001.

31 - *Ibid.*, p. 21.

32 - Id., *Erfahrung und Urteil*, Felix Meiner, Hamburg 1939.

33 - A.W. Richardson, *Carnap's Construction of the World: The Aufbau and the Emergence of Logical Empiricism*, Cambridge University Press, New York 1998.

34 - V. Fano, *L'analisi carnapiana del concetto di spazio*, in A. Pasquinelli (ed.), *L'eredità di Rudolf Carnap*, CLUEB, Bologna 1995, pp. 297-318.

35 - R. Carnap, *Intellectual Autobiography*, in P. A. Schilpp (ed.), *The Philosophy of Rudolf Carnap*, Open Court, La Salle 1963, pp. 3-84.

influence of Kant and the neo-Kantians, especially Natorp and Cassirer, as based on 'pure intuition' and independent of contingent experience.³⁶

From the Neo-Kantian perspective, reality lies beyond the reach of direct knowledge. What we perceive and understand of the world is shaped by the a priori forms of intuition (space and time) and the categories of the intellect. This mediation of subjectivity in the constitution of experience resonates in Carnap's epistemological framework. Carnap adopts and radicalizes this idea by asserting that all statements about reality are metaphysical, and, in his view, meaningless.³⁷ He maintains that such statements, involving ontological commitments, lack empirically verifiable content and are logically undecidable. "In other words, the 'metaphysical' concept of reality lies outside the boundary of science, not simply because it has no experiential or verifiable meaning, but because it has no 'constructional' meaning at all: that is, it has no 'logical,' 'rational,' 'non-intuitive'".³⁸

Statements such as "reality exists independently of our perception" or "there is an objective external world" are problematic, as they cannot be confirmed or falsified by experience.³⁹ For Carnap, philosophy should abandon traditional ontological disputes and instead focus on the logical analysis of scientific language and its formal structures. He retains a firmly anti-metaphysical stance, holding that meaningful statements must be traceable to empirical data or logical relations. All others, especially those of classical metaphysics, are to be dismissed as pseudo-problems. This view is reinforced in his *Autobiography*, where he acknowledges the influence of Wittgenstein's verification principle.⁴⁰

The view that these sentences and questions are non-cognitive was based on Wittgenstein's verifiability principle. This principle says first, that the meaning of

36 - R. Carnap, *Intellectual Autobiography*, in P. A. Schilpp (ed.), *The Philosophy of Rudolf Carnap*, Open Court, La Salle 1963, p. 23.

37 - As Mario Alai has convincingly shown, Carnap's anti-metaphysical stance should not be interpreted as a blanket rejection of all discourse concerning reality, but rather as a critique of statements that lack empirical or logical criteria of meaning. Our formulation is therefore intended only as a simplified characterization of Carnap's position in the context of the Aufbau. For a more nuanced and definitive discussion of Carnap's relation to realism and metaphysics, see M. Alai, *How I Developed My Views on Realism* in A. Angelucci, V. Fano, G. Ferretti, G. Galli, P. Graziani, G. Tarozzi, M. Alai et al., *Realism and Antirealism in Metaphysics, Science and Language. Festschrift for Mario Alai*, FrancoAngeli, Milano 2024.

38 - M. Friedman, *Carnap's Aufbau Reconsidered*, in «Noûs», 21 (1987), n. 4, pp. 521-545.

39 - The statement of Carnap is quite similar to 6.5 in L. Wittgenstein, *Tractatus Logico-Philosophicus*, translated by C. K. Ogden, Routledge & Kegan Paul, London 1922.

40 - For a detailed analysis of the debate surrounding the verification principle, which does not yet appear in the Aufbau but begins to emerge in *Scheinprobleme*, see T. Uebel, *Verificationism and (Some of) its Discontents*, in «Journal for the History of Analytical Philosophy», 7 (2019), n. 4, pp. 1-31.

a sentence is given by the conditions of its verification and, second, that a sentence is meaningful if and only if it is in principle verifiable, that is, if there are possible, not necessarily actual, circumstances which, if they did occur, would establish the truth of the sentence. This principle of verifiability was later replaced by the more liberal principle of confirmability.⁴¹

This marks a clear divergence from the Neo-Kantian tradition and moves Carnap toward a radical form of logical empiricism. In the final section, we will argue that the *Aufbau* exemplifies a form of structural empiricism distinct from this radical constructivism. First, however, the next section will analyze the central points of Carnap's quasi-analysis framework.

4. The key points of *Aufbau*

Carnap's *Aufbau* is a controversial work open to a variety of interpretations and it has been read as an empiricist text. This section provides an overview of the key elements in *Aufbau* that challenge the standard reading of the work and supports an interpretation aligned with the structural empiricism presented in Section 2. In his work, Carnap identifies four categories of notions in the empirical sciences: auto-psychological experiences, physical entities, hetero-psychological states, and cultural objects. Auto-psychological experiences include perceptions, emotions, and mental states. These are accessible only to the subject who experiences them and, for Carnap, form the foundational basis of empirical knowledge.

The thus-ordered elementary experiences themselves, their constituents and components, and the more complex entities to be constructed from these, form the domain of objects of which I am conscious, or my consciousness. This domain forms the foundation of the domain of the auto-psychological.⁴²

Physical entities refer to objects of the physical world, described by the natural sciences. These are constituted from classes of qualities and relations. Although natural sciences postulate them, the theory of constitution is only a rational reconstruction of already established objects. "It can furthermore be shown that physical objects are epistemologically secondary relative to auto-psychological objects, since the recognition of physical objects depends upon perception".⁴³

41 - R. Carnap, *Intellectual Autobiography*, in P. A. Schilpp (ed.), *The Philosophy of Rudolf Carnap*, Open Court, La Salle 1963, p. 53.

42 - *Ibid.*, p. 203.

43 - *Ibid.*, p. 307.

Hetero-psychological states encompass the beliefs, emotions, and perceptions of others. These differ from auto-psychological experiences as they are inferred rather than directly perceived. In Carnap's system, these are essential for understanding intersubjective communication.

The construction of the heteropsychological can be an assignment only to the body of the other, not to his mind, which, after all, cannot be constructed in any other way than through this assignment; thus, constructionally, the other mind does not even exist before this assignment is carried out. Secondly, the assigned psychological events are auto-psychological events for the very same reason: the only psychological entities which have been constructed up to this point are auto-psychological entities, and no other can be constructed prior to this assignment; there is no possibility of constructing non-autopsychological entities other than with the aid of precisely this assignment.⁴⁴

Lastly, cultural objects exist only within a cultural or social context, such as artworks or social norms.

The object "state" could perhaps be constructed in the following form: a relational structure of persons is called a "state" if it is characterized in such and such a way through its manifestations, namely, the psychological behaviour of these persons and the dispositions toward such behaviour, especially the disposition, on the part of some persons, to act upon the volitions of others. Sociological groups or organizations are, among others, the most important higher cultural objects.⁴⁵

For Carnap, cultural objects are not reducible to physical objects; they have a normative rather than purely empirical dimension. Carnap's epistemological system arranges these objects according to their epistemological reducibility. The result is a step-by-step logical system in which scientific objects are formally framed through basic concepts (auto-psychological experiences). Importantly, we have direct access only to these experiences. Yet, as Carnap notes, the recognition of this epistemological primacy comes after the development of scientific theories. That is, it is not initially obvious that an experience is subjective. Carnap refrains from attributing any ontological commitment to these categories. All scientific notions are quasi-objects: they possess logical structure but lack ontological status. His primary aim is to unify the sciences—to create a general framework capable of expressing all scientific objects using a single class of quasi-object. The

44 - R. Carnap, *Intellectual Autobiography*, in P. A. Schilpp (ed.), *The Philosophy of Rudolf Carnap*, Open Court, La Salle 1963, p. 215.

45 - *Ibid.*, p. 231.

method of quasi-analysis is central to this project. It echoes the logic of equivalence relations developed by Frege⁴⁶ and by Russell and Whitehead⁴⁷. The process begins with the auto-psychological experiences of an individual and attempts to construct all other scientific objects from these elementary experiences. This construction is supported by one additional two-place logical term: the recollection of similarity among observed data. Carnap's method groups elementary experiences into *quality classes* (elements sharing a property) and *sense classes* (all experiences of a particular sensation). These are then distinguished using dimensional criteria. For example, Carnap explains that the visual quality space has five dimensions: two for spatial coordinates, and three for hue, brightness, and saturation. This construction is not a proper analysis but a quasi-analysis, since lived experiences are methodologically indecomposable. The process yields quasi-components from which scientific objects are constructed. Notably, Carnap acknowledges that scientific construction has already occurred; quasi-analysis merely reconstructs it. A key insight of the *Aufbau* is the principle of epistemological primacy: A is epistemologically prior to B if B is required to know A. Carnap uses formal logic, drawing on Frege's logic courses and Russell's *Principia Mathematica*, to translate all scientific statements into statements about a single class of entity. He chooses auto-psychological experiences as the epistemological base, because physical objects are known through them, but not vice versa: "Since, according to Carnap, physical objects are known through the mediation of auto-psychological objects but not vice versa, it follows that an auto-psychological basis is most appropriate from an epistemological viewpoint"⁴⁸. In this way, Carnap assigns epistemological primacy to auto-psychological experiences over all other scientific quasi-objects. His logical construction thus mirrors the epistemological process of acquiring scientific notions, illustrating that Carnap's goal is genuinely philosophical: to make science both logically transparent and intellectually comprehensible. It is worth noting, as Francesco Barone⁴⁹ observed, that the only realism Carnap allows is sense-data realism, inherited from Russell.⁵⁰ This is apparent in the preface to

46 - G. Frege, *Über Sinn und Bedeutung*, in «Zeitschrift für Philosophie und philosophische Kritik», 100 (1892), pp. 25-50.

47 - B. Russell - A. N. Whitehead, *Principia Mathematica*, vol. I, Cambridge University Press, New York 1910.

48 - M. Friedman, *Carnap's Aufbau Reconsidered*, in «Noûs», 21 (1987), n. 4, p. 524.

49 - F. Barone, *Il neopositivismo logico*, Laterza, Bari 1953.

50 - Although F. Barone's interpretation remains historically significant, especially within the context of twentieth-century Italian scholarship on logical empiricism, its reception has been more limited in the broader international literature on Carnap and the Vienna Circle. We cite Barone primarily because of his insightful emphasis on the epistemological dimension of Carnap's early work, rather than as a definitive

the second edition of *Aufbau*: “I should now consider for use as basic elements, not elementary experiences, but concrete sense data”⁵¹. This philosophical position has largely been discredited. Today, we generally regard perceptions as representations of external objects that causally interact with us. Whether these representations are accurate is a separate question, which we do not address here. One final remark: the starting point of the *Aufbau* must be experience, due to its epistemological primacy. However, this experience should not be understood as in Mach’s framework⁵², these experiences should not be understood as the elements of Mach’s approach, in which each element is considered a unique sensory datum and analyzed independently, but rather as *Gestalten*, in the sense of Köhler⁵³ and Wertheimer⁵⁴. These are experiences that gain significance only when seen holistically in the process of quasi-analysis: “the basic elements of the constructional system cannot be analyzed through construction. Thus, the elementary experiences cannot be analyzed in our system since this system takes them as basic elements”⁵⁵. In the *Aufbau*, Carnap moves away from the material a priori as proposed – for instance by Husserl in *Erfahrung und Urteil*.⁵⁶ Instead, Carnap adopts a softer form of empiricism compared to his later works; however, the influences of Husserl remain present in the project. Although Carnap does not fully adopt a Kantian position, the process of abstraction in his system can still proceed even in the absence of transitivity, and withstand the critique later raised

account of the *Aufbau*. For broader historical and philosophical perspectives on the Italian reception of logical empiricism and its relation to phenomenology, see P. Parrini, *Filosofia e scienza nell’Italia del Novecento*, Le Lettere, Firenze 2004; and Id., *Empirismo logico e fenomenologia*, in F. Masi (ed.), *Tra Esperientia ed Experimentum. Percorsi del pensiero del Novecento*, ETS, Pisa 2023.

51 - R. Carnap, *Intellectual Autobiography*, in P. A. Schilpp (ed.), *The Philosophy of Rudolf Carnap*, Open Court, La Salle 1963, p. 8.

52 - The present discussion is intended primarily to provide the historical and conceptual background necessary for our comparison with Carnap’s *Aufbau*. It is therefore not meant to offer a comprehensive treatment of the contemporary debate on intuition and self-evidence. For more systematic and up-to-date analyses of these issues, see E. C. Banks, *The Realistic Empiricism of Mach, James, and Russell: Neutral Monism Reconciled*, Cambridge University Press, New York 2014, P. Gori, *Ernst Mach dal punto di vista storico-critico*, in *Ernst Mach tra scienza e filosofia*, ETS, Pisa 2018, pp. 11-31 and M. Textor, *Mach’s Neutral Monism*, in «HOPOS: The Journal of the International Society for the History of Philosophy of Science», 11 (2021), n. 1, pp. 143-165.

53 - W. Köhler, *Die physischen Gestalten in Ruhe und im stationären Zustand*, Vieweg Verlag, Braunschweig 1925.

54 - M. Wertheimer, *Laws of Organization in Perceptual Forms*, in «Psychologische Forschung», 4 (1923), pp. 301-350.

55 - R. Carnap, *Intellectual Autobiography*, p. 110.

56 - E. Husserl, *Erfahrung und Urteil*, Felix Meiner, Hamburg 1939.

by Goodman, due to the firmly structured nature of experience, which manifests in Gestalt-like processes, as we will show in Section 6. A similar perspective can be found in Cassirer's *Substanzbegriff und Funktionsbegriff*,⁵⁷ particularly in his discussion of concept formation. In his view, scientific objects are conceived as idealizations of sensations⁵⁸. These objects are not given directly, but are constructed, one could say, as a sum of intuitions. Cassirer contrasts his view with that of Scholasticism, which raises the issue of

The necessity, to which physical theory tends, has been opposed to the evidence and truth, which comes to consciousness in the experience of individual facts. This separation, however, rests upon a false abstraction; it is based in the attempt to isolate two moments from each other, which are inseparably connected together by the very presuppositions of the formation of concepts.⁵⁹

In this sense, one may observe a parallel between Cassirer's account and the notion of quasi-abstraction as we interpret it within the framework of structural empiricism. Like Carnap, Cassirer is not strictly Kantian: in his view, the idealization of scientific objects originates in intuition and sensation, and these constructions form the ideal objects that science investigates.

In our view, to rehabilitate Carnap's philosophy today, we should retain the core principles of the *Aufbau*. The only element we might discard is sense-data realism. In epistemology, perceptions are not considered ontologically independent; rather, they are modes of interacting with the world. Still, Carnap's emphasis on the primacy of auto-psychological experience, the parallelism between logical construction and epistemological acquisition, and the aspiration to unify the sciences remain vital. Carnap himself makes this clear:

Construction theory agrees with transcendental idealism in the conception that all objects of cognition are constructed (in idealistic language: 'are created in thought'); in fact, the constructed objects are objects of conceptual knowledge only qua logical forms which are generated in a certain way.⁶⁰

It is important to note that the primary role of auto-psychological experiences over all other scientific quasi-objects is a conventional stance, as it applies to all

57 - E. Cassirer, *Substanzbegriff und Funktionsbegriff*, Wissenschaftliche Buchgesellschaft, Darmstadt 1910.

58 - For a detailed analysis see E. Cassirer, *Substance and Function and Einstein's Theory of Relativity*, Dover Publications, New York 1953, pp. 148-151.

59 - *Ibid.*, p.148.

60 - R. Carnap, *Intellectual Autobiography*, in P. A. Schilpp (ed.), *The Philosophy of Rudolf Carnap*, Open Court, La Salle 1963, p. 285.

possible bases. However, once the choice of a basis is made, it determines the entirety of the logical structure, which in turn constitutes the method of quasi-analysis. For the Carnap of the *Aufbau*, the epistemological order is of primary importance, and this is the guiding aim of his logical reconstruction. This structure, however, must be understood in light of the “imperfect community” problem identified by Goodman: “the very problem of abstraction is to define, in terms of the primitive relation of concrete individuals, the conditions under which a set of such individuals have a common quality.”⁶¹ Even though the quasi-analysis systematically groups experiences based on similarity, these groupings may not be perfectly consistent across all observers. Nonetheless, by giving to auto-psychological experiences a primary role, Carnap establishes a stable epistemic framework that allows the logical construction to proceed, providing a methodical way to handle experiential variation while preserving the structural integrity of the system.

5. Against the critiques of the *Aufbau*

Before proceeding further, it is useful to briefly consider two significant rehabilitations of *Aufbau* by authoritative scholars: Thomas Mormann⁶² and Hannes Leitgeb⁶³. Both authors attempt to reformulate Carnap’s *Aufbau* in ways that respond to the criticisms raised by Goodman and Quine. Leitgeb proposes a revised formulation of the *Aufbau* program through what they term a “new attempt at an *Aufbau*-like system:” “every scientific sentence can be translated to an empirically equivalent one which consists solely of logico-mathematical signs and terms that refer to experience, such that the translation image expresses a subject-invariant constraint on experience”⁶⁴. What is relinquished from Carnap’s original program is the commitment to strict logical reduction and universal definability, i.e., the explicit step-by-step logical definitions Carnap sought, along with the ambition to reconstruct science solely through logical processes. Leitgeb’s proposal addresses several problems raised by Goodman.⁶⁵ One key issue concerns the possibility that the quasi-analysis method may result in groupings of experimental

61 - Goodman, N. (1966). *The structure of appearance*. Indianapolis: Bobbs-Merrill.

62 - T. Mormann, *New Work for Carnap’s Quasi-Analysis*, in «Journal of Philosophical Logic», 38 (2009), n. 3, pp. 249-282.

63 - H. Leitgeb, *New Life for Carnap’s Aufbau?*, in «Synthese», 180 (2011), n. 2, pp. 265-299.

64 - *Ibid*, p. 268.

65 - N. Goodman, *The Significance of Der logische Aufbau der Welt*, in P. A. Schilpp (ed.), *The Philosophy of Rudolf Carnap*, Open Court, La Salle 1963, pp. 545-558.

elements based on relational similarity for unrelated or arbitrary reasons. To counter this, Leitgeb modifies Carnap's framework in two steps:

- Introduction of the trope theory: Each object is viewed as a bundle of tropes⁶⁶ (i.e., localized properties), which helps to spatially and temporally ground experiential content.
- Replacement of the single relation with two distinct relations: one governs the constitution of basic elements, and the other governs temporal overlap. These refinements allow for a more nuanced representation of similarity and help avoid arbitrary groupings. The "gluing" of tropes into quasi-objects is governed by principled constraints derived from trope theory.

Another concern raised by Goodman is the discrepancy between Carnap's notion of finite subjective experience and the five-dimensional structure of visual quality space. Leitgeb resolves this by allowing for an infinite number of possible tropes, thereby departing from Carnap's finite conception of quality spaces:

The similarity relation functions as a 'neighbourhood' relation on the phenomenal quality points, which is all that is needed in order to define a topology on its connectivity components. What Carnap overlooked when doing so, but what Goodman observed, was that every finite topological space is zero-dimensional.⁶⁷

This allows for the coherent reconstruction of spaces such as the five-dimensional visual field (two spatial, three chromatic dimensions) without inconsistency. Leitgeb also addresses Quine's criticism of Carnap's treatment of physical objects:

Carnap did not seem to recognize, however, that his treatment of physical objects fell short of reduction not merely through sketchiness, but in principle. Statements of the form 'Quality q is at point-instant x; y; z; t' were, according to his canons, to be apportioned truth values in such a way as to maximize and minimize certain over-all features, and with growth of experience the truth values were to be progressively revised in the same spirit. I think this is a good schematization (deliberately oversimplified, to be sure) of what science does; but it provides no indication, not even the sketchiest, of how a statement of the form 'Quality q is at x; y; z; t' could ever be translated into Carnap's initial language of

⁶⁶ - For an overview of Tropes theories, see P. Simons, *Particulars in Particular Clothing: Three Trope Theories of Substance*, in «Philosophy and Phenomenological Research», 54 (1994), n. 3, pp. 553-575.

⁶⁷ - H. Leitgeb, *New Life for Carnap's Aufbau?*, in «Synthese», 180 (2011), n. 2, p. 276.

sense data and logic. The connective 'is at' remains an added, undefined connective; the canons counsel us in its use but not in its elimination.⁶⁸

Leitgeb responds by abandoning Carnap's demand for definability of theoretical terms solely from experiential terms. Instead, they propose a more modest revision that focuses on empirical equivalence: a scientific statement may be translated into another with the same observable consequences, even if not logically equivalent. In this updated model, theoretical terms gain meaning only within the context of the entire theory.

The second significant reinterpretation comes from Mormann⁶⁹, who explores the broader applicability of quasi-analysis in fields such as mathematics, cognitive science, and computer science. Of particular interest for our discussion is their response to Goodman's criticisms. Mormann refers to the unpublished 1923 manuscript by Carnap⁷⁰, which provides an alternative set of conditions for quasi-analysis:

Let M be a non-homogeneous set. A set Q provides a quasi-analysis of M iff the following requirements are satisfied for all elements of M :

(C1) If two elements of M are similar, they share at least one quasi-property $q \hat{=} Q$.

(C2) If two elements of M are not similar, they do not share any quasi-property $q \hat{=} Q$.

(C3) If two elements a and b of M are similar to exactly the same elements, they have the same quasi-properties.

(C4) There is no proper subset Q' of Q such that the elements of Q' satisfy (C1),

(C2), and (C3) for all elements of M .⁷¹

The first two conditions, (C1) and (C2), are essential for establishing a valid connection between similarity and shared properties. These are present in *Aufbau* and are necessary for quasi-analysis to function. The additional conditions, (C3) and (C4), while not included in *Aufbau*,⁷² are crucial in addressing Goodman's objections.

68 - *Ibid.*, pp. 267.

69 - T. Mormann, *New Work for Carnap's Quasi-Analysis*, in «Journal of Philosophical Logic», 38 (2009), n. 3, pp. 249-282.

70 - R. Carnap, *Die Quasizerlegung: Ein Verfahren zur Ordnung nichthomogener Mengen mit den Mitteln der Beziehungslehre* (unpublished manuscript RC-081-04-01), University of Pittsburgh, Pittsburgh 1923.

71 - T. Mormann, *New Work for Carnap's Quasi-Analysis*, in «Journal of Philosophical Logic», 38 (2009), n. 3, pp. 253.

72 - One interesting point to note is that Carnap was aware of the problem with the *Aufbau*. He explained it in a letter to Goodman in 1938.

- Condition (C3) ensures that if two elements share the exact similarity structure, they must share the same quasi-properties. This addresses the problem of arbitrary or inconsistent distribution of properties.
- Condition (C4) invokes a kind of *Occam's razor* by eliminating redundant quasi-properties, those that always co-occur with others, thus mitigating the problem of "constant companionship" identified by Goodman.

Mormann also demonstrates how these refinements help avoid Goodman's "imperfect community" problem, where similar objects may be described with sets of properties that lack a univocal rule for property assignment. The added conditions enable the construction of more coherent representations, thereby resolving issues like the *Goodmanian triangle*, whose vertices are similar but share no single property. This scenario violates (C3) and is thus excluded by Mormann's improved model.

It is worth noting that both Leitgeb and Mormann largely set aside the broader epistemological context we explored in Section 2. While their technical and formal contributions are invaluable, our aim is distinct: to show that Carnap's quasi-analysis, far from being a merely formal reconstruction, represents a deep philosophical response to the problem of the relation between logic and experience, a position closely aligned with what we have termed structural empiricism. It is important to keep in mind that the *Aufbau* should be read in the same context as Carnap's earlier works, rather than through the lens of his later views. The Carnap of the *Aufbau* still preserves several important elements inherited from the Husserlian phenomenological tradition, even though these are reinterpreted within a distinct logical and epistemological framework. As we presented in Section 3, although he rejects the notion of a material a priori, he posits a form of intuition that plays a key epistemological role. Carnap himself further supports this reading of the *Aufbau*: in 1962, when the work was translated into English, he reiterated his interpretation of the entire work, without introducing a neutral theory of constitutional systems of concepts applicable to all scientific bases. Indeed, the choice of epistemic basis is fundamental.⁷³ This point will be the focus of the concluding section.

6. A new perspective on the *Aufbau*: structural empiricism

Carnap builds his logical system on the *Gestalten* of our sensible experience. Certain relations connect these *Gestalten*, most notably through the memory of

⁷³ - While it is true that Carnap's position changes significantly in his later works, it is necessary to attempt a reversal of the usual analysis of Carnap in order to reevaluate his work. Our view is that the *Aufbau* should be read as the culmination of German philosophy, rather than as the starting point of empiricism.

partial similarities between experiences. These experiences can be analyzed in terms of their constituents; however, it is crucial to recognize that experiences are psychological, they are “lived,” whereas “constituents” belong to theoretical language and are already conceptually constructed. As Carnap states: “Elementary experiences are essentially unanalyzable units, which has, after all, led us to choose them as basic elements”⁷⁴. They are, in other words, unanalyzable wholes. Contrary to common belief, the fundamental issue in quasi-analysis is not the problem of abstraction. Carnap is well aware that similarity is not a transitive relation. A reflexive and symmetric relation cannot generate non-overlapping similarity classes. As discussed in the previous section through Mormann’s analysis, Carnap had already formulated additional axioms in 1923 to address this issue, yet he chose not to include them in the *Aufbau*. He devotes several pages to discussing the imperfect separation of similarity circles. Why did Carnap avoid adding more axioms to resolve the problem?

For Carnap, logical and linguistic instruments must take intuition into account. While the two additional axioms, which represent an application of Occam’s razor that is “is used to exclude “unfavorable circumstances” in which one quasi-property always appears accompanied by another one”⁷⁵ and a kind of indiscernibility condition (which states that two empirical experiences that are similar to the same experiences should share the same quasi-properties), are well-suited to addressing the problem of the “imperfect community,” they are too stringent when considering intuition. These axioms are more appropriate within the framework of *dianoia*, which refers to the step-by-step, logical form of thinking that characterizes much of scientific and mathematical reasoning. Intuition, however, should be aligned more closely with *nous*, which refers to the immediate, non-discursive intellectual insight that grasps truths without the need for reasoning or argumentation. Unlike *dianoia*, which proceeds through formal logic and argumentation, *nous* reflects the kind of intuition that is crucial to mathematical insight and which we propose as fundamental in structural empiricism. A possible explanation for Carnap’s decision not to add these axioms is that quasi-analysis must adhere to an epistemological constraint, just like the *Gestalten* and the similarity relation themselves. Reflexivity and symmetry of similarity are epistemologically reasonable, more stringent properties of the similarity relation would not be effective. Carnap was aware that Husserl believed *Gestalten* possess an internal structure that could be explained in a pure theory of experience, i.e., phenomenology. However, Carnap does not follow

74 - R. Carnap, *The Logical Structure of the World*, University of California Press, Berkeley 1967.

75 - T. Mormann, *New Work for Carnap’s Quasi-Analysis*, in «Journal of Philosophical Logic», 38 (2009), n. 3, p. 253.

this idea, and his theory relies on Gestalt-like structures and similarity relations, aligning with the role assigned by Brentano to apodictic experiences. These Gestalt-like structures show that experiential configurations appear necessary or natural, even though they are not derived from formal reasoning. While auto-psychological experience holds epistemological primacy, Carnap recognized that it does not possess ontological priority. Gestalten, as we now understand them, are constructs that emerge only through the development of empirical science. Experience is indeed epistemologically prior, but it is not a pure given upon which science can be built directly. Moreover, Carnap should not be labelled an empiricist in the tradition of Mach. The quasi-analysis does not yield a conventionalist theory inspired purely by experience. Rather, it generates a framework grounded in experience without reducing theory to empirical convention, since the structure of quasi-constituents cannot be derived straightforwardly from psychological data. At the same time, Carnap does not fully align with Kantianism. He accepts the Kantian epistemological renunciation of absolute reality, a view reflected in Husserl's *epoché*⁷⁶. The Kantian approach offers significant epistemological support to science, and Carnap clearly draws on this line of thought. For him, experience is deeply structured through logical constructs. Nevertheless, it retains an inherent and irreducible structure. As Carnap writes:

Our problem now is how science can arrive at intersubjectively valid assertions if all its objects are to be constructed from the standpoint of the individual subject, that is, if in the final analysis all statements of science have as their object only relations between 'my' experiences? Since the stream of experience differs for each person, how can there be one objective statement of science in this sense (i.e., which holds for every individual, even though he starts from his own individual stream of experience)? The solution to this problem lies in the fact that, even though the material of the individual streams of experience is entirely different, or rather altogether incomparable, since a comparison of two sensations or two feelings of different subjects, as far as their immediately given qualities are concerned, is absurd, specific structural properties are analogous for all streams of experience. Now, if science is to be objective, then it must restrict itself to statements about such structural properties, and, as we have seen earlier, it can restrict itself to statements about structures, since all objects of knowledge are not content, but form, and since they can be represented as structural entities⁷⁷.

76 - E. Husserl, *Ideas Pertaining to a Pure Phenomenology and to a Phenomenological Philosophy*. First Book, translated by F. Kersten, Nijhoff, The Hague 1982.

77 - R. Carnap, *The Logical Structure of the World*, University of California Press, Berkeley 1967, pp. 106-107

This quotation explains our use of the term structural empiricism. In this paper, we have argued that *Aufbau* can be fruitfully reinterpreted from an epistemological standpoint grounded in structural empiricism. Within this framework, the focus is not on justifying scientific concepts directly through sensory data but on emphasizing the structural role of subjective experience and self-evidence in the constitution of knowledge. We contend that Carnap's quasi-analysis is not a mere technical misstep but a profound epistemological gesture: science, no matter how abstract, must remain anchored in the structure of subjective experience. In this regard, Carnap anticipates a view similar to those of Angelucci and Stegmüller, who emphasize that experience, intuition, and self-evidence play a regulative, though not justificatory, role in epistemology. The epistemological thesis at the heart of the *Aufbau* is extremely nuanced. In our interpretation, it should not be reduced to empiricism, Kantianism, or phenomenology. Rather, Carnap critically reflects on the possibility of creating a scientific language that is both logically rigorous and grounded in lived experience. Ultimately, reading *Aufbau* through the lens of structural empiricism allows us to rehabilitate Carnap's project. His work remains a compelling attempt to reconcile the formal structures of science with the complexity of human experience. To understand science, we must view it through the lens of our auto-psychological experiences. However, we must also recognize that these experiences themselves cannot be the subject of scientific inquiry. What is possible, rather, is to construct a language of empirical quasi-constituents that renders even the most abstract concepts of science more comprehensible.

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