



Carnap on unified science



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ABSTRACT

Unified science is a recurring theme in Carnap's work from the time of the *Aufbau* until the end of the 1930's. The theme is not constant, but knows several variations. I shall extract three quite precise formulations of the thesis of unified science from Carnap's work during this period: from the *Aufbau*, from Carnap's so-called syntactic period, and from *Testability and Meaning* and related papers. My main objective is to explain these formulations and to discuss their relation, both to each other and to other aspects of Carnap's work.

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 WELTAUFASSUNG

In the opening sentence of a famous paper [Oppenheim and Putnam \(1958\)](#) complained that “the expression ‘Unity of Science’ is often encountered, but its precise content is difficult to specify in a satisfactory manner”. Oppenheim and Putnam will have encountered the expression, or some close relative of it, in many of Rudolf Carnap's works; it is, however, not true of Carnap that he did not fill the expression with precise content. In fact, Carnap's works from the time of *Der logische Aufbau der Welt* ([1928a](#), hereafter cited as *Aufbau*) and about a decade onwards contain, more or less explicitly, three quite precise formulations of the thesis of the unity of science, or unified science, as I shall prefer to call it. It is the aim of this paper to state these various precise formulations, explain the technical terms they involve, and place the views of unified science they express in the context of Carnap's work more generally during this period.

Unified science is a recurring theme in Carnap's works from the time of the *Aufbau* through the 1930's, with connections to many

other Carnapian themes, such as constitution theory, intersubjectivity, physicalism, protocol sentences and their place in scientific theories, and the logical empiricist theory of meaning in its various manifestations. It is therefore a topic worthwhile studying, not only because of its intrinsic interest, but also because of the light doing so may shed on the development of Carnap's thought during this period. Although studies of the topic can be found in the secondary literature,¹ it seems to me that few have clearly distinguished the various stages in Carnap's thinking about unified science; nor, as far as I know, has anyone extracted precise formulations of the thesis of unified science from Carnap's writings. Hence there is room for an addition to the Carnap literature attempting to do these things.

As already noted, one finds in Carnap's work from the *Aufbau* until the latter part of the 1930's three quite precise formulations of the thesis of unified science. Each formulation belongs to a separate period and can be associated with a subset of Carnap's works during the period in question. In the *Aufbau* and writings relying on the constitution system developed in that work, the thesis of unified science is closely related to constitution theory and its aims.

- (1) All **concepts** of science can be *explicitly defined* from a handful of primitive relations within a simple type hierarchy whose base type consists of “elementary experiences”.

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¹ [Creath \(1996\)](#), [Pincock \(2003\)](#), [Frost-Arnold \(2005\)](#), [Ouelbani \(2005\)](#).

During the “syntactic period”—covering *Die physikalische Sprache als Universalsprache der Wissenschaft* (Carnap, 1932b, hereafter cited as *Universalsprache*), *Psychologie in physikalischer Sprache* (1932c, hereafter cited as *Psychologie*), and *Logische Syntax der Sprache* (1934b, hereafter cited as *Syntax*)—Carnap turns from considering concepts and their constitution to considering languages and their relation to each other.

- (2) Every **sentence** of science can be *translated* into the language of physics, a certain higher-order language containing variables ranging over real numbers.

From the rather abstract considerations that this formulation of the thesis of unified science gives rise to, Carnap turns to the life-world, as it were, in *Testability and meaning* (1936a; 1937b, hereafter cited as *Testability I* and *II* respectively) and a couple of related publications (Carnap, 1936b, 1938). Science is now to be built up from the so-called thing language, a language that speaks about the ordinary things surrounding us. The building is to be erected not only by means of explicit definition, as in constitution theory, but also by means of what Carnap calls reduction sentences.

- (3) All **predicates** of science can be *either explicitly defined from or “reduced to” observable predicates*.

The terms highlighted in these various formulations by means of **boldface type**, *italicization*, and underlining may be considered as parameters, defining the **objects**, the *means*, and the target of the unification of science according to the formulation in question. Terms in different formulations highlighted in the same way can be said to play the same role in their respective formulations. Below each formulation will be dealt with in turn in sections 2–4. Section 1 is devoted to preliminary remarks. The final section 5 briefly discusses the place of the thesis of unified science in Carnap’s later works. Translations from German are as a rule my own. Translated passages quoted in the main text are accompanied by a footnote providing the original German. Passages quoted only in a footnote are given in English only.

1. Preliminary remarks

I take ‘unified science’ to be the proper translation of the German ‘Einheitswissenschaft’, whereas ‘unity of science’ rather translates ‘Einheit der Wissenschaft’. The term ‘Einheitswissenschaft’ occurs prominently in the Vienna Circle manifesto (*Der Wiener Kreis*, 1929), for instance in the sentence that serves as the epigraph of this paper. In Carnap’s own publications the term begins to appear in 1930.² Before that, in particular in the *Aufbau*,³ Carnap had used the term ‘Gesamtwissenschaft’ in speaking about unified science. ‘Gesamtwissenschaft’ is sometimes translated as ‘the whole of science’,⁴ but in the context of Carnap’s work in general and the *Aufbau* in particular such a translation is inadequate for at least three reasons. Firstly, it makes nonsense of phrases like ‘die eine Gesamtwissenschaft’ occurring for instance in *Aufbau* §§ 2, 179.⁵ Secondly, it is clear from *Aufbau* §§ 2, 4, 179 that this one *Gesamtwissenschaft* is the unified science that the unification of the domain of objects effected by constitution theory

makes possible (more on that later). Thirdly, Carnap continues to use ‘Gesamtwissenschaft’ also after adopting the term ‘Einheitswissenschaft’ and then only as a stylistic variant of the latter.⁶ Hence it is clear that in the context of Carnap’s work ‘Gesamtwissenschaft’ and ‘Einheitswissenschaft’ should be translated as the same word, and to my mind ‘unified science’ is the best choice in English.

According to Carnap (cf. 1934b, p. 249) it was Neurath who introduced the term ‘Einheitswissenschaft’ (as well as the term ‘Physikalismus’) into the vocabulary of the Vienna Circle. Where Neurath had the term from I do not know, but Neurath (1932a, p. 395) cites Lewin (1925, p. 7) as noting that it is used by Oppenheimer (1919, pp. 3 ff) in the relevant sense. Anyhow, it was through Neurath’s organizational activities that this term, in German as well as in the English translations ‘unified science’ and ‘unity of science’, became something of a trademark of logical empiricism. An important conference series with six instalments between 1935 and 1941 was called, in English, *International Congress for the Unity of Science*.⁷ A publication series initiated by Neurath was called *Einheitswissenschaft*.⁸ Another, very ambitious, publication project was the *International Encyclopedia of Unified Science*.⁹ Finally, one may mention Neurathian coinages such as ‘The Unity of Science Institute’ and ‘Unity of Science Movement’.¹⁰ Neurath’s own thinking regarding unified science was closely tied to these organizational activities and especially to the project of an encyclopedia. It would, however, take us too far afield to go into these topics here.¹¹

By science Carnap understands the total system of knowledge,¹² or in a more syntactic formulation “the totality of accepted sentences.”¹³ That science is unified means that there is, in principle, only one science. It is a further question precisely what it means for there to be only one science. Although we shall find different formulations of the thesis of unified science defended by Carnap at different stages from the time of the *Aufbau* until the late 1930’s, there is an underlying idea that appears to guide much of his thinking regarding unified science during this period: science is unified if there is only one domain of objects for science to investigate. Thus, in *Aufbau* § 4 Carnap says:

There is only one domain of objects, and therefore only one science.¹⁴

⁶ See Carnap (1932b, p. 448) and *Syntax* § 74.

⁷ See Stadler (1997, pp. 402–436) for more details.

⁸ The titles of this series have now been published in a single volume, Schulte and McGuinness (1992).

⁹ On aspects of the history of this Encyclopedia, see Dahms (2005) and Morris (1960).

¹⁰ What was the business of the Institute I do not know. The term ‘unity of science movement’ occurs in (Neurath, 1938, p. 1); Carnap (1942, p. 286) describes it as “a wider movemet [sc. than the Vienna Circle], comprising besides Logical Empiricism other groups and individuals with related views in various countries”.

¹¹ Besides Neurath (1932a, b), discussed below, see also Neurath (1933, 1935, 1936, 1938). Reisch (1994) provides a helpful discussion. Some comparisons of Carnap and Neurath on unified science can be found in Creath (1996), Frost-Arnold (2005), and Ouelbani (2005).

¹² *Aufbau* § 180: “Science, the system of conceptual knowledge, ...” Carnap (1934c, p. 6): “*Philosophy is the theory of science* (wherein here and in the following ‘science’ is always meant in the comprehensive sense of the collective system of the knowledge of any kind of entity: physical and psychic, natural and social entities.)”.

¹³ Carnap (1934a, p. 90): “By ‘science’ is here understood the totality of accepted sentences; here belongs not only the assertions of the scientist, but also those of everyday life: between these two domains there is no strict border.”

¹⁴ *Aufbau* § 4: “Es gibt nur ein Gebiet von Gegenständen und daher nur eine Wissenschaft.”

² See Carnap (1930b, p. 24) and Carnap (1930e).

³ But also in (Carnap, 1927).

⁴ For instance by Damböck (2012, p. 83), who maintains that *Gesamtwissenschaft* is something “totally different” from *Einheitswissenschaft*.

⁵ In the *Aufbau* Carnap writes ‘ein’ for the numeral, thus distinguishing it by means of an acute accent over the ‘e’ from the indefinite article ‘ein’.

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