
LOGICAL POSITIVISM

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Protocol Sentences

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(TRANSLATED BY GEORGE SCHICK)

WITH THE PROGRESS of knowledge, the number of expressions which are formulated with a high degree of precision in the language of Unified Science is continually on the increase. Even so, no such scientific term is wholly precise; for they are all based upon terms which are essential for *protocol sentences*; and it is immediately obvious to everyone that these terms must be vague.

The fiction of an ideal language constructed out of pure atomic sentences is no less metaphysical than the fiction of Laplace's demon. The language of science, with its ever increasing development of symbolic systems, cannot be regarded as an approximation to such an ideal language. The sentence "Otto is observing an angry person" is less precise than the sentence "Otto is observing a thermometer reading 24 degrees," insofar as the expression "angry person" cannot be so exactly defined as "thermometer reading 24 degrees." But "Otto" itself is in many ways a vague term. The phrase "Otto is observing" could be replaced by the phrase "The man, whose carefully taken photograph is listed no. 16 in the file, is observing": but the term "photograph listed no. 16 in the file" still has to be replaced by a system of mathematical formulae, which is unambiguously correlated with another system of mathematical formulae,

This article first appeared in Volume III of *Erkenntnis* (1932/33). It is published here with the kind permission of Mrs. Marie Neurath and Professor Rudolf Carnap. At the beginning of his article Neurath had the following note: "References will be to Rudolf Carnap's article, 'Die Physikalische Sprache als Universalsprache der Wissenschaft,' *Erkenntnis*, 1932, Vol. II, pp. 432ff.* Since there is widespread agreement with Carnap, we shall adopt his terminology. So that I need not repeat what I have already written elsewhere, I refer the reader to my articles 'Physikalismus,' *Scientia*, 1931, pp. 297 ff. and 'Soziologie im Physikalismus,' *Erkenntnis*, Vol. II, 1932, pp. 393 ff."

[* There is an English translation of this article by Max Black under the title "The Unity of Science." It was published as a monograph by Kegan Paul, London.]

the terms of which take the place of "Otto," "angry Otto," "friendly Otto," etc.

What is originally given to us is our *ordinary natural language* with a stock of imprecise, unanalyzed terms. We start by purifying this language of metaphysical elements and so reach the *physicalistic ordinary language*. In accomplishing this we may find it very useful to draw up a list of proscribed words.

There is also the *physicalistic language of advanced science* which we can so construct that it is free from metaphysical elements from the start. We can use this language only for special sciences, indeed only for parts of them.

If one wished to express all of the unified science of our time in one language, one would have to combine terms of ordinary language with terms of the language of advanced science, since, in practice, the two overlap. There are some terms which are used only in ordinary language, others which occur only in the language of advanced science, and still others which appear in both languages. Consequently, in a scientific treatise concerned with the entire field of unified science only a "slang" comprising words of both languages will serve.

We believe that every word of the physicalistic ordinary language will prove to be replaceable by terms taken from the language of advanced science, just as one may also formulate the terms of the language of advanced science with the help of the terms of ordinary language. Only the latter is a very unfamiliar proceeding, and sometimes not easy. Einstein's theories are expressible (somehow) in the language of the Bantus—but not those of Heidegger, unless linguistic abuses to which the German language lends itself are introduced into Bantu. A physicist must, in principle, be able to satisfy the demand of the talented writer who insisted that: "One ought to be able to make the outlines of any rigorously scientific thesis comprehensible in his own terms to a hackney-coach-driver."

The language of advanced science and ordinary language coincide today primarily in the domain of arithmetic. But, in the system of radical physicalism, even the expression "2 times 2 is 4," a *tautology*, is linked to protocol sentences. Tautologies are defined in terms of sentences which state how tautologies function as codicils appended to certain commands under certain circumstances. For instance: "Otto says to Karl 'Go outside when the flag waves *and* when 2 times 2 is four.'" The addition of the tautology here does not alter the effect of the command.

Even considerations of rigorous scientific method restrict us to

the use of a "universal slang." Since there is as yet no general agreement as to its composition, each scholar who concerns himself with these matters must utilize a universal slang to which he himself has contributed new terms.

There is no way of taking conclusively established pure protocol sentences as the starting point of the sciences. No *tabula rasa* exists. We are like sailors who must rebuild their ship on the open sea, never able to dismantle it in dry-dock and to reconstruct it there out of the best materials. Only the metaphysical elements can be allowed to vanish without trace. Vague linguistic conglomerations always remain in one way or another as components of the ship. If vagueness is diminished at one point, it may well be increased at another.

We shall, from the very first, teach children the universal-slang—purged of all metaphysics—as the language of the historically transmitted unified science. Each child will be so trained that it starts with a simplified universal-slang, and advances gradually to the use of the universal-slang of adults. In this connection, it is meaningless to segregate this children's language from that of the adults. One would, in that case, have to distinguish several universal-slans. The child does not learn a *primitive* universal-slang from which the universal-slang of the adults derives. He learns a "poorer" universal-slang, which is gradually filled in. The expression "ball of iron" is used in the language of adults as well as in that of children. In the former it is defined by a sentence in which terms such as "radius" and " π " occur, while in the children's definition words such as "nine-pins," "present from Uncle Rudi," etc. are used. But "Uncle Rudi" also crops up in the language of rigorous science, if the physical ball is defined by means of protocol sentences in which "Uncle Rudi" appears as "the observer who perceives a ball."

Carnap, on the other hand, speaks of a *primitive* protocol language.¹ His comments on the primitive protocol language—on the protocol sentences which "require no verification"—are only marginal to his significant anti-metaphysical views, the mainspring of which is not affected by the objections here brought forward. Carnap speaks of a primary language, also referred to as an experiential or as a phenomenalist language. He maintains that "at the present stage of inquiry, the question of the precise characterization of this language cannot be answered." These comments might induce

1. *Op. cit.*, *Erkenntnis*, Vol. II, pp. 437 ff. and 453 ff. (*Unity of Science*, pp. 42 ff. and 76 ff.).

younger men to search for a protocol language of the sort described: and this might easily lead to metaphysical deviations. Although metaphysical speculation cannot altogether be restrained by argument, it is important, as a means of keeping waverers in line, to maintain physicalism in its most radical version.

Apart from tautologies, unified science consists of factual sentences. These may be sub-divided into

- (a) protocol sentences
- (b) non-protocol sentences.

Protocol sentences are factual sentences of the same form as the others, except that, in them, a personal noun always occurs several times in a specific association with other terms. A complete protocol sentence might, for instance, read: "Otto's protocol at 3:17 o'clock: [At 3:16 o'clock Otto said to himself: (at 3:15 o'clock there was a table in the room perceived by Otto)]." This factual sentence is so constructed that, within each set of brackets, further factual sentences may be found, viz.: "At 3:16 o'clock Otto said to himself: (At 3:15 o'clock there was a table in the room perceived by Otto)" and "At 3:15 o'clock there was a table in the room perceived by Otto." These sentences are, however, not protocol sentences.

Each term occurring in these sentences may, to some extent, be replaced at the very outset by a group of terms of the language of advanced science. One may introduce a system of physicalistic designations in place of "Otto," and this system of designations may, in turn, further be defined by referring to the "position" of the name "Otto" in a group of signs composed of the names "Karl," "Heinrich," etc. All the words used in the expression of the above protocol sentence are either words of the universal-slang or may without difficulty be replaced at any moment by words of the universal-slang.

For a protocol sentence to be complete it is essential that the name of some person occur in it. "Now joy," or "Now red circle," or "A red die is lying on the table" are not complete protocol sentences.² They are not even candidates for a position within the innermost set of brackets. For this they would, on our analysis, at least have to read "Otto now joy," or "Otto now sees a red circle," or "Otto now sees a red die lying on the table"—which would roughly correspond to the children's language. That is, in a full protocol sen-

2. Cf. Carnap, *op. cit.*, *Erkenntnis*, Vol. II, pp. 438 ff. (*Unity of Science*, pp. 43 ff.).

tence the expression within the innermost set of brackets is a sentence which again features a personal noun and a term from the domain of perception-terms. The relative extent to which terms of ordinary language and of the language of advanced science are used is of no significance, since the universal-slang may be used with considerable flexibility.

The expression "said to himself," after the first bracket, recommends itself when, as above, one wants to construct various groups of sentences, as, for instance, sentences incorporating reality-terms, or hallucination-terms, or dream-terms, and especially when one wants to identify unreality as such. For instance, one could say: "Otto actually said to himself, 'There was nothing in the room but a bird perceived by Otto' but, in order to amuse himself, he wrote, 'There was nothing in the room but a table perceived by Otto.'" This is especially pertinent to the discussion in the next section, in which we reject Carnap's thesis to the effect that protocol sentences are those "which require no verification."

The transformation of the sciences is effected by the discarding of sentences utilized in a previous historical period, and, frequently, their replacement by others. Sometimes the same form of words is retained, but their definitions are changed. *Every law and every physicalistic sentence of unified-science or of one of its sub-sciences is subject to such change. And the same holds for protocol sentences.*

In unified science we try to construct a non-contradictory system of protocol sentences and non-protocol sentences (including laws).³ When a new sentence is presented to us we compare it with the system at our disposal, and determine whether or not it conflicts with that system. If the sentence does conflict with the system, we may discard it as useless (or false), as, for instance, would be done with "In Africa lions sing only in major scales." One may, on the other hand, *accept* the sentence and so change the system that it remains consistent even after the adjunction of the new sentence. The sentence would then be called "true."

The fate of being discarded may befall even a protocol sentence. No sentence enjoys the *noli me tangere* which Carnap ordains for protocol sentences. Let us consider a particularly drastic example. We assume that we are acquainted with a scholar called "Kalon," who can write with both hands simultaneously. He writes with his left hand, "Kalon's protocol at 3:17 o'clock: [At 16 minutes 30

3. Cf. Carnap, *op. cit.*, *Erkenntnis*, Vol. II, pp. 439 ff. (*Unity of Science*, pp. 47 ff.).

seconds past 3 o'clock Kalon said to himself: (There was *nothing* in the room at 3:16 o'clock except a table perceived by Kalon)].” At the same time, with his right hand, he writes, “Kalon’s protocol at 3:17 o'clock: [At 16 minutes 30 seconds past 3 o'clock Kalon said to himself: (There was *nothing* in the room at 3:16 o'clock except a bird perceived by Kalon)].” What is he—and what are we—to make of the conjunction of these two sentences? We may, of course, make statements such as “Marks may be found on this sheet of paper, sometimes shaped this way and sometimes that.” With respect to these marks on paper, however, Carnap’s word “verification” finds no application. “Verification” can only be used with reference to sentences, that is, with reference to sequences of marks which are used in a context of a reaction-test and which may systematically be replaced by other marks.⁴ Synonymous sentences may be characterized as stimuli which under specific reaction-tests evoke the same responses. Chains of ink-marks on paper and chains of air-vibrations which may under specific conditions be co-ordinated with one another are called “sentences.”

Two conflicting protocol sentences cannot both be used in the system of unified science. Though we may not be able to tell which of the two is to be excluded, or whether both are not to be excluded, it is clear that not both are verifiable, that is, that both do not fit into the system.

If a protocol sentence must in such cases be discarded, may not the same occasionally be called for when the contradiction between protocol sentences on the one hand and a system comprising protocol sentences and non-protocol sentences (laws, etc.) on the other is such that an extended argument is required to disclose it? On Carnap’s view, one could be obliged to alter only non-protocol sentences and laws. *We also allow for the possibility of discarding protocol sentences. A defining condition of a sentence is that it be subject to verification, that is to say, that it may be discarded.*

Carnap’s contention that protocol sentences do not require verification, however it may be understood, may without difficulty be related to the belief in *immediate experiences* which is current in traditional academic philosophy. According to this philosophy there are, indeed, certain *basic elements* out of which the world-picture is to be constructed. On this academic view, these *atomic experiences* are, of course, above any kind of critical scrutiny; they do not require verification.

Carnap is trying to introduce a kind of *atomic protocol*, with

4. Cf. my article in *Scientia*, p. 302.

his demand that "a clear-cut distinction be made in scientific procedure between the adoption of a protocol and the interpretation of the protocol sentences," as a result of which "no indirectly acquired sentences would be accepted into the protocol."⁵ The above formulation of a complete protocol sentence shows that, insofar as personal nouns occur in a protocol, interpretation must *always* already have taken place. When preparing scientific protocols, it may be useful to phrase the expression within the innermost set of brackets as simply as possible, as, for instance, "At 3 o'clock Otto was seeing red," or—another protocol—"At 3 o'clock Otto was hearing C sharp," etc. But a protocol of such a sort is not primitive in Carnap's sense, since one cannot, after all, get around Otto's act of perception. There are no sentences in the universal-slang which one may characterize as "more primitive" than any others. All are of equal primitiveness. Personal nouns, words denoting perceptions, and other words of little primitiveness occur in all factual sentences, or, at least, in the hypotheses from which they derive. All of which means that *there are neither primitive protocol sentences nor sentences which are not subject to verification.*

The universal-slang, in the sense explained above, is the same for the child as for the adult. It is the same for a Robinson Crusoe as for a human society. If Crusoe wants to relate what he registered ("protokolliert") yesterday with what he registers today, that is, when he wants to have any sort of recourse to a language, he cannot but have recourse to the inter-subjective language. The Crusoe of yesterday and the Crusoe of today stand to one another in precisely the relation in which Crusoe stands to Friday. Consider a man who has both lost his memory and been blinded, who is now learning afresh to read and to write. The notes which he himself took in the past and which now, with the aid of a special apparatus, he reads again are for him as much the notes of some other man as notes actually written by someone else. And the same would still be the case after he had realized the tragic nature of his circumstances, and had pieced together the story of his life.

In other words, *every language as such* is inter-subjective. The protocols of one moment must be subject to incorporation in the protocols of the next, just as the protocols of A must be subject to incorporation in the protocols of B. *It is therefore meaningless to talk, as Carnap does, of a private language, or of a set of disparate protocol languages which may ultimately be drawn together.*

5. *Op. cit.*, p. 437 (*Unity of Science*, p. 42).

The protocol languages of the Crusoe of yesterday and of the Crusoe of today are as close and as far apart from one another as are the protocol languages of Crusoe and of Friday. If, under certain circumstances, the protocol languages of yesterday's Crusoe and of today's are called the *same* language, then one may also, under the same circumstances, call the protocol language of Crusoe and that of Friday the same language.

In Carnap's writings we also encounter an emphasis on the "I" familiar to us from idealistic philosophy. In the universal-slang it is as meaningless to talk of a *personal* protocol as to talk of a *here* or a *now*. In the physicalistic language personal nouns are simply replaced by co-ordinates and coefficients of physical states. One can distinguish an *Otto-protocol* from a *Karl-protocol*, but not a protocol of one's own from a protocol of others. The whole puzzle of *other minds* is thus resolved.

Methodological solipsism and *methodological positivism*⁶ do not become any the more serviceable because of the addition of the word "methodological."⁷

For instance, had I said above, "Today, the 27th of July, I examine protocols both of my own and of others," it would have been more correct to have said "Otto Neurath's protocol at 10:00 a.m., July 27, 1932; [At 9:35 o'clock Otto Neurath said to himself: (Otto Neurath occupied himself between 9:40 and 9:57 with a protocol by Neurath and one by Kalon, to both of which the following two sentences belong: . . .)]." Even though Otto Neurath himself formulates the protocol concerning the utilization of these protocols, he does not link his own protocol with the system of unified science in any different way from that in which he links Kalon's. It may well happen that Neurath discards one of Neurath's protocols, and adopts in its stead one of Kalon's. The fact that men generally retain their own protocol sentences more obstinately than they do those of other people is a historical accident which is of no real significance for our purposes. Carnap's contention that "every individual can adopt only his own protocol as an epistemological basis" cannot be accepted, for the argument presented in its favor is *not* sound: "S₁ can, indeed, also utilize the protocol of S₂—and the incorporation of both protocol languages in physicalistic language makes this utilization particularly easy. The utilization is, however, indirect: S₁ must first state in his own protocol that he sees a piece of writing

6. Cf. Carnap, *op. cit.*, *Erkenntnis*, Vol. II, p. 461 (*Unity of Science*, p. 93).

7. Cf. my article in *Erkenntnis*, Vol. II, p. 401. [Translated in the present volume, see p. 282 below.]

of such and such a form.”⁸ *But Neurath must describe Neurath’s protocol in a manner analogous to that in which he describes Kalon’s!* He describes how Neurath’s protocol looks to him as well as how Kalon’s does.

In this way we can go on to deal with everyone’s protocol sentences. Basically, it makes no difference at all whether Kalon works with Kalon’s or with Neurath’s protocols, or whether Neurath occupies himself with Neurath’s or with Kalon’s protocols. In order to make this quite clear, we could conceive of a sorting-machine into which protocol sentences are thrown. The laws and other factual sentences (including protocol sentences) serving to mesh the machine’s gears sort the protocol sentences which are thrown into the machine and cause a bell to ring if a contradiction ensues. At this point one must either replace the protocol sentence whose introduction into the machine has led to the contradiction by some other protocol sentence, or rebuild the entire machine. *Who* rebuilds the machine, or *whose* protocol sentences are thrown into the machine is of no consequence whatsoever. Anyone may test his own protocol sentences as well as those of others.

SUMMING UP:

Unified science utilizes a universal-slang, in which terms of the physicalistic ordinary language necessarily also occur.

Children can be trained to use the universal-slang. Apart from it we do not employ any specially distinguishable “basic” protocol sentences, nor do different people make use of different protocol languages.

We find no use in unified science for the expressions “methodological solipsism” and “methodological positivism.”

One cannot start with conclusively established, pure protocol sentences. Protocol sentences are factual sentences like the others, containing names of persons or names of groups of people linked in specific ways with other terms, which are themselves also taken from the universal-slang.

The Vienna Circle devotes itself more and more to the task of expressing unified science (which includes sociology as well as chemistry, biology as well as mechanics, psychology—more properly termed “behavioristics”—as well as optics) in a unified language, and with the displaying of the inter-connections of the various sciences which are so often neglected; so that one may without

8. Cf. Carnap, *op. cit.*, *Erkenntnis*, Vol. II, p. 461 (*The Unity of Science*, p. 93).

difficulty relate the terms of any science to those of any other. The word "man" which is prefixed to "makes assertions" is to be defined in just the same way as the word "man" occurring in sentences which contain the words "economic system" and "production."

The Vienna Circle has received powerful encouragement from various sources. The achievements of Mach, Poincaré, and Duhem have been turned to as good account as the contributions of Frege, Schröder, and Russell. Wittgenstein's writings have been extraordinarily stimulating, both through what has been taken from them and through what has been rejected. His original plan—to use philosophy as a ladder which it is necessary to climb in order to see things clearly—may, however, be considered to have come to grief. The main issue in this, as in all other intellectual activities, will always be to bring the sentences of unified science—both protocol sentences and non-protocol sentences—into consonance with one another. For this, a *logical syntax* of the sort toward which Carnap is working is required—Carnap's *logical reconstruction of the world* being the first step in this direction.

The discussion I have initiated here—for Carnap will certainly find much in the corrections to correct again and to develop—serves, as do so many of our other efforts, to secure ever more firmly the common, broad foundations on which all the adherents of physicalism base their studies. Discussions of peripheral issues, such as this one, are, however, going to play a continuously diminishing role. The rapid progress of the work of the Vienna Circle shows that the planned co-operative project dedicated to the construction of unified science is in constant development. The less time we find it necessary to devote to the elimination of ancient confusions and the more we can occupy ourselves with the formulation of the inter-connections of the sciences, the quicker and more successful will this construction be. To this end it is of the first importance that we learn how to use the physicalistic language, on behalf of which Carnap, in his article, entered the lists.