

The influence of Einstein on Wittgenstein's philosophy*

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1. Introduction

“Following according to the rule is FUNDAMENTAL to our language game. It characterizes what we call description. This is the similarity of my treatment with relativity theory, that is to speak a consideration about the clocks with which we compare events.” RFM VI, 28

This quotation comes from Wittgenstein's later remarks on the foundation of mathematics. What struck me first was the term “fundamental” written in capital letters by one of the most “anti-foundationalist” philosophers; the second striking element is the reference to Relativity Theory, and I was prompted to ask whether Einstein actually did have any real impact on Wittgenstein's philosophy. Although some critical remarks on the connection between Wittgenstein and Einstein have been made by Hintikka and Hintikka (1986), the critical literature does not provide many answers¹, and so I have tried to work them out for myself. Certainly Wittgenstein did not express as great an admiration for Einstein as he did, for instance, for Frege². Yet a great deal of evidence points to an influence deeper than is normally thought to be the case. I shall attempt to demonstrate this evidence and analyse what theoretical gains are to be had from this comparison. Below I shall provide the historical setting which *allows* the claim that Einstein did influence Wittgenstein (§2). Then follow some quotations from the *Nachlass* to support the claim that Wittgenstein took special care to show that he was in tune with Relativity Theory (§ 3). Finally I shall show how this attitude to Einstein's Relativity Theory helps us to clarify some of the central tenets in Wittgenstein's earlier verificationism (§4), his “grammatical turn” (§5) and his later remarks on rule following (§6).

2. Historical evidence

A short summary of facts, dates, publications and events will help focus on the question before we move on to deal with conceptual problems. First of all, generally speaking, Wittgenstein's intellectual training as an engineer was very similar to Einstein's, with a basic knowledge of physics and mathematics. In fact, he was sufficiently interested in physics that he wanted to attend Boltzmann's lectures in Vienna (he was unable to because

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¹ Some of the first (and few) references to Einstein's connection with Wittgenstein are to be found in Hallett (1977) p. 406; Hintikka-Hintikka (1986) ch.I, §11 quote MS 109 where Wittgenstein speaks of “linguistic relativity” and stresses the fact that Wittgenstein, at the time of MS 109, was “preoccupied with the way different propositions are in fact verified”. Therefore they see the analogy with Einstein in the fact that Einstein grounded his theory by discussing “the ways in which certain propositions (ascriptions of simultaneity of time) can or cannot be verified.” Some recent hints on Wittgenstein's remarks on relativity are given in Brenner (2003) in an original exercise of imaginative reconstruction of Wittgenstein's ideas.

² Wittgenstein's admiration of Frege is well known; the few references to Einstein are less respectful; comparing portraits of great XIX century musicians with portraits of Russell, Freud and Einstein, Wittgenstein was speaking of “degeneration” of our times (Drury 1984, p.112). In VB, p.54, Einstein is said to have “talent”, but not to be “great” (however Wittgenstein thought *of himself* as just having talent).

of Boltzman's suicide)³. In Wittgenstein's environment in Vienna as well as Cambridge many people were discussing Relativity Theory, particularly his friends, from Schlick to Russell.

Wittgenstein must certainly have been impressed by the confirmation of Einstein's Relativity Theory in November 1919: most newspapers in Europe had front-page headlines announcing the confirmation by observations of the eclipse⁴, and it would have been impossible for him on his return home from the war not to have taken an interest in the most outstanding scientific discovery of the century. Wittgenstein had been released from the concentration camp of Cassino in August 1919, and at the beginning of December 1919 - worried about the publication of his *Tractatus* - met Russell in Holland. In 1920 Einstein lectured in Vienna, and in 1921 Russell wrote to Wittgenstein (then an elementary school teacher in Austria) about his lessons in China: "My students are all Bolsheviks (...) I lecture to them on Psychology, Philosophy, Politics and Einstein". This letter suggests that the importance of Einstein was taken for granted between the two.

One source of Wittgenstein's interest in Relativity Theory is certainly his meeting with Schlick, who taught Theoretical Physics in Vienna and was one of the main interpreters of Relativity Theory, as recognised by all neopositivists, starting with Reichenbach 1921. His work, especially his publication *Raum und Zeit in der gegenwärtigen Physik. Zur Einführung in das Verständnis der Relativitätstheorie* (1917) was highly esteemed by Einstein, as is clear from the Einstein-Schlick correspondence⁵. Schlick contacted Wittgenstein by mail in 1924 and in person in 1927, after having sent him some of his publications (certainly including works on Relativity Theory). The two had many conversations, especially in 1927 and between late 1929 and 1931. On May 23rd 1931 Wittgenstein was teaching in Cambridge, and surely could not have missed the important occasion of the honorary degree awarded to Einstein, who had spent some time at the Cambridge observatory with Eddington⁶.

It is difficult to say with certainty whether Wittgenstein actually met Einstein or discussed Relativity Theory with Schlick in any detail. There is no visible reference to Relativity theory or the subject of simultaneity in the reports of the conversation at Schlick's house by Waismann, even though there are references to non Euclidean geometries, Riemannian geometry specifically, and to Einstein's point of view on geometry⁷. But it would have been extremely unusual for Schlick to have abstained from any mention of one of his major life interests in conversations with Wittgenstein. Another indirect evidence of Wittgenstein's relationship with Einstein is the discussion of Einstein's analysis of simultaneity presented as an example of philosophical clarification in Waismann's *Principles of linguistic Philosophy*. Although published in 1956 the book had been substantially written in the thirties as an attempt to give an ordered exposition of Wittgenstein's ideas. The main point of the discussion is that Einstein's clarification is a

³ Janik and Toulmin 1973 ch.vi; McGuinness 1988 thinks that he was probably attracted by the philosophy of Boltzmann more than by physics (see also Visser 1999). Still, the desire to study with Boltzmann is certainly linked to real interest in physics.

⁴ See Elton (1986).

⁵ See Howard (1984).

⁶ Clark (1973), p. 398.

⁷ See WWK, pp. 38 and 162. Implicit references to non Euclidean geometry can be found also in RFM, such as the remark that there are propositions which can be proved in the Euclidean system, but are false in other systems (e.g. RFM I, app.III, 7). We may also remark that the discussions reported in WWK reflect Waismann's main interest in the philosophy of logic and mathematics, which leave out problems in the philosophy of physics which were of more interest to Schlick.

passage from the question of the simultaneity of events to the question of the *meaning of an assertion about the sameness of time*. The stress here is no longer on verificationism, as in the early moments of neopositivism, but on grammar and on meaning as use⁸.

Furthermore Wittgenstein had almost certainly read Eddington's divulgative work, which he sometimes cites approvingly: "My view agrees completely with those of modern physics (Eddington)"⁹. Eddington had published his popular exposition of the Relativity Theory in 1922, and Russell wrote his *ABC of Relativity Theory* in 1925. It is difficult to avoid the idea that Wittgenstein had seen not only Schlick's books - received directly from their author - but also Eddington's and Russell's divulgative books. It is also likely that he could have obtained *Über die Spezielle und die allgemeine Relativitätstheorie* by Einstein (1916) and perhaps even *The evolution of Physics* (1938) by Einstein and Infeld. Hallett (1977) gives a list of "authors Wittgenstein knew or read", which included some of Einstein's works. However, these are conjectures, and the reference to Relativity Theory in Wittgenstein's texts are of such a general nature that we cannot exclude the possibility of knowledge only through secondary sources. This short historical summary is a reminder of the fact that Wittgenstein not only had some connections with Einstein's relativity theory (who didn't?) but also that he had connections with some of the main interpreters and supporters of Einstein's view, such as Schlick and Eddington, and had constantly been exposed to discussions on Einstein's theory of relativity, to the point that his "verificationist" turn is almost certainly linked – as it is normally taken for granted in the literature – to Einstein's theory of Relativity. Moreover, the way in which Wittgenstein constantly refers to Relativity Theory, has something more than a mere recognition of the most relevant discovery of the century. Let us then take then a brief look at some citations from the *Nachlass*.

3. Textual evidence

The first thing to do when one has concerns about Wittgenstein is to look into the CD of Wittgenstein's *Nachlass*, where relevant data are readily available¹⁰. In the *Nachlass* there are numerous "robust" sentences (sentences that are repeated in different contexts at different times) recurring in many passages until they eventually find a better place (in some more refined typescript). On the subject of Einstein and Relativity Theory, Wittgenstein repeats several "robust sentences" in various periods:

Mainly from '29 until '33:

- (1) «In dem "nicht über sich selbst hinauskönnen" liegt die Ähnlichkeit meiner Betrachtungen und jener der Relativitätstheorie» (In the "not being able to go beyond themselves" we find the similarity between my observations and those of Relativity Theory) [Ms 108 p.270-71, Ms 210, p.70; Ms 212, p.985, TS 212: 985; Big Typescript: §76, p. 356].
- (2) «Einstein: Wie eine Grösse gemessen wird, das ist sie» ("Einstein: how a magnitude is measured is what it is") [Ms 107, p.143; Ms 113, p.142; Ms 130,p.241; and, together with

⁸ See Waismann (1956), ch.1, §3.

⁹ MS 107,p.223. In a later version the remark is given without the reference to Eddington: "I agree with the views of contemporary physicists when they say that the signs in their equations no longer have any 'meanings' and that physics cannot arrive at any such meanings, but has to stop at the signs". BT I, §23 (p.122). He probably despised Eddington's divulgative work and took some distance from it, while still demonstrating knowledge of his texts; in fact, in BT II, §105. (p. 519) Wittgenstein expresses less admiration for Eddington's way of divulging important physical concepts.

¹⁰ There are at least 9 occurrences of "Einstein" and 12 occurrences of the term "Relativitätstheorie". These are to be added to the 3 occurrences of "Einstein" and 7 occurrences of "Relativitätstheorie" in the published papers.

«Wie ein Satz verifiziert wird, das sagt er» (How a sentence is verified is what it says): Ms 211, p.732; 212 and *Big Typescript*: § 60, p. 208; §136, p. 488 (737); see also PB 166; PG II, § 39, pp.459]

From '41 onwards:

(3) «Das ist die Ähnlichkeit meiner Betrachtung mit der Relativitätstheorie, dass sie sozusagen eine Betrachtung über die Uhren ist mit denen wir die Ereignisse vergleichen» (This is the similarity of my treatment with relativity theory, that is, so to speak, a consideration about the clocks with which we compare events) [Ms 164: 82; RFM VI: §28; cfr.UG: 303-305]

Wittgenstein very rarely cites other thinkers or theories, and this abundance of citation is, therefore, something remarkable. Furthermore, these citations are repeated many times between 1929 and 1950, and the fact that they change at some of the turning points of Wittgenstein's philosophy is good evidence that the connection with Relativity Theory is not a superficial one, but something which Wittgenstein must have continuously thought about, giving it more weight than is normally believed. Actually Wittgenstein was very reluctant to endorse scientific points of view, and always tried to avoid too strict a connection with science. This attempt to distance himself from science and scientific thought is set aside only in the case of his explicit appreciation of relativity theory as something akin to his own view. This constant returning to Relativity theory is therefore something truly unusual for Wittgenstein and cannot be dismissed as casual or irrelevant.

What follows can be considered as evidence of the influence of Einstein's work on Wittgenstein, or, on a looser reading, of Wittgenstein's attempt to integrate Einstein's ideas into his philosophy. In general I think that this evidence cannot be dismissed as part of a general *Zeitgeist* on the relativity of cultural systems exemplified by Spengler. There is something more specific in the references to Einstein. Therefore I shall attempt to interpret the citations, following the main turning points in Wittgenstein's philosophy: verificationism (1929), grammar (1933) and rule following (1938).

A methodological remark is useful here: we must be careful when drawing a comparison between Wittgenstein and Einstein, given that the former is apparently distant from a scientific research which represented the principal aim of the latter (Wittgenstein is *not* searching for a unifying physical structure underlining or explaining linguistic phenomena). Therefore the analogy between Relativity Theory and Wittgenstein's philosophy is to be found in a methodological concern: Relativity Theory concerns the analysis of systems of measurement as Wittgenstein's philosophy concerns the conceptual structures of descriptions. This assumption helps explain Wittgenstein's citation of Einstein, and this will become clearer in § 6 in the discussion on rule-following considerations.

4. Einstein's impact on Wittgenstein's verificationism

In the late twenties, after the first World War, the Vienna Circle was discussing the *Tractatus* and the relevance of Einstein's theory on the verificationist point of view. Verificationism was developed after Schlick's analysis of the concept of simultaneity. The interpretation of Einstein as a forerunner of the verificationist thesis of the Wiener Kreis is widely described by Philipp Frank (1949) who insisted on citing Einstein on the aim of science: "to coordinate our experiences and to bring them into a logical system"¹¹. Frank's

¹¹ Frank 1949 quoting from Einstein's Princeton Lecture of 1921. Other quotations regarding "metaphysics or empty talk" come from Einstein's contribution to the Schilpp volume on Bertrand Russell (Einstein 1944). Frank had been in direct

paper is a very general one, noting some similarity between Einstein and the Vienna Circle's fight against metaphysics. Discussing the relativity of simultaneity, Einstein stresses the fact that "unless we are told the reference-body to which the statement of time refers, there is *no meaning* in a statement of the time of an event." (Einstein 1916, p. 31, my italics)¹². A discussion on meaningless statements was certainly welcome to a *Wiener Kreis* working on the *Tractatus* and on the distinction between sense and nonsense, meaningful and meaningless statements. As Schlick had pointed out, Einstein's analysis of the concept of time consists of "nothing but the analysis of the meaning of our statements about the simultaneity of spatially separated events"¹³. To show the meaning of simultaneity you have to show "how the proposition 'two events are simultaneous' is verified. But with this you have completely determined its meaning" (Schlick 1932, p. 90). It is also possible to suppose a reverse influence of the Wiener Kreis on Einstein's way of presenting his theory in his book written with Infeld in 1938. This book has an overabundance of discourse on the "meaning of sentences": here Einstein and Infeld discuss the difference in meaning of the word "simultaneously" in classical and relativity theory. They present their task as one of *understanding the meaning of the sentence* "two events which are simultaneous in one CS [Coordinate System], may not be simultaneous in another CS" (Einstein-Infeld, p.179). They go on to say that intuitively everyone seems to know the meaning of the sentence, but they warn against overestimating intuition. After setting up a (mental) experiment to define when two clocks at rest are synchronised (the clocks show the same time when looked at from the same distance from an intermediate point in a given inertial system), they assert that "to say that one of the distant events happens before the other has now a definite meaning" (p.182). But this meaning was not defined before the experimental setting.

Wittgenstein's remarks on Einstein written during the period of his meetings with Schlick and other members of the *Wiener Kreis* concern measurement and verification. These remarks refer indirectly, but obviously, to Einstein's definition of "simultaneity". The sentence "how a magnitude is measured is what it is" is repeated in various passages in the *Nachlass*, and it reappears together with the explicit reference to verificationism in various passages, from the *Philosophische Bemerkungen* to the *Big Typescript*: "The verification is not *one* token of the truth, it is *the* sense of the proposition. (Einstein: How a magnitude is measured is what it is)." (PB § 166). In BT I/§60 the "motto" ascribed to Einstein is preceded by the remark: "How language distances itself from a description of a verification. How abstract it gets. We have to rediscover that we measure time with a clock. And in the process we don't even notice that we've made a grammatical discovery". The point is made again in the last part of BT:

"It is differently verified and so is of a different kind. The verification is not a mere indication of the truth, but determines the sense of the proposition. (Einstein: how a magnitude is measured is what it is.)" (BT II/end of §136; cfr. PG II/ end of §39).

contact with Einstein as a young physicist. See Neurath 1936 or Haller 1986.

¹² Even more clearly Einstein 1916a (at the end of §3 of part A, p.776) says: "All our space-time verifications invariably amount to a determination of space-time coincidences. If, for example, events consisted merely in the motion of material points, then ultimately nothing would be observable but the meetings of two or more of these points. Moreover, the result of our measurements are nothing but verifications of such meetings of the material points of our measuring instruments with other material points, coincidences between the hands of a clock and points of the clock dial, and observed point-events happening at the same place at the same time"

¹³ For the sake of simplicity I quote here from Schlick (1932) p.89.

We may say that Wittgenstein gives a very general picture which connects Einstein's notion of magnitude and the verificationist concept of the sense of a sentence. However this was the main point of the neopositivistic interpretation of Einstein at the end of the twenties, and certainly Wittgenstein participated in the elaboration of the verificationist principle. Perhaps, we might also say, as Hacker (1986) does, that in the *Tractatus* we have the seeds of verificationism, but Wittgenstein really needed a "fresh start" after the *Tractatus* and this start was supported by a verificationistic interpretation of the concept of meaning as truth conditions (beginning with PB 19, 48). Apparently the "fresh start" began at the time when Wittgenstein met the main interpreter of Einstein's philosophy, Moritz Schlick. Hymers (2005) discusses the short period in which Wittgenstein held a "strict" verificationist theory of meaning, linked to Schlick's epistemological concerns, and which represented a defined "interlude" in Wittgenstein's thought.

Even granted that this is so, we cannot avoid the problem of justifying the recurrent use of verificationist themes in Wittgenstein's later work; Marconi (2002) remarked, contrary to Wrigley (1989) and others, that although the main core of Wittgenstein's verificationism was defined in 1929, some of the verificationist attitude remained throughout all the phases of his philosophy, albeit in a more critical way. In fact, his dissatisfaction with the phenomenological language of the *Philosophische Bemerkungen* was not a rejection of verificationism, which was still considered a possible option even at the time of *Philosophical Investigation* or later, as we see in his remarks on "the language game of verification" in RFM (VII, 73), written in the forties, or in his discussion of "our whole system of verification" in UG (279) written in the early fifties. It appears as if remnants of verificationism are still influencing the late Wittgenstein – still under the influence of Einstein's idea of verification, which seems so deeply rooted in Wittgenstein's thought that it comes out in some of his discussions of various topics, such as his treatment of inner states.

A particularly clear example is given in *Philosophical Investigations*, § 350. Here Wittgenstein says that it is not possible to pass from understanding the meaning of "it is 5 o'clock" to understanding the meaning of "it is 5 o'clock on the sun". The argument is reminiscent of old discussions regarding the definition of simultaneity, even if framed in a more intuitive and simplified manner¹⁴:

"The explanation by means of identity does not work here. For I know well enough that one can call 5 o'clock here and 5 o'clock there "the same time", but what I do not know is in what cases one is to speak of its being the same time here and there."
(PU350)

Apparently the example does not need Relativity theory to be understood (on the sun there is no day or night, no measurement of time as on earth). But Wittgenstein wanted to clarify a point discussed with Schlick and Waismann regarding the idea that in order to speak of "simultaneity" or "sameness of time" you need to have some definite procedure to verify it. It is therefore reasonable to say that Wittgenstein here uses the heritage of the discussion on the meaning of a sentence concerning time or simultaneity as a means to treat other topics such as inner states: as we need a precise experimental setting to give meaning to a sentence

¹⁴ Cf. also BB §§ 51-53. Waismann 1965 expresses the point in saying that Einstein suggested that the word "simultaneity" must be defined when used in different space-regions; the intuitive meaning of the word as such cannot be applied in such cases. As mentioned, the discussion of the notion of simultaneity was almost certainly the starting problem of the verificationist principle.

on simultaneous events (sameness of time), we also need a precise setting to give meaning to sentences on pain or inner states (sameness of pain). Here “it is 5 o’clock on the sun” is used as an example to dismantle the idea that the meaning of a sentence can be generalised to every context without a previous decision of the kind of verification needed¹⁵. If we lack any kind of method of verification, the sentence will be meaningless. “I am in pain”, used as a description, takes in this case the role of “it is 5 o’clock on the sun”. The kinds of verifications (or criteria) for evaluating “he is in pain” cannot be used for “I am in pain”, in the same way that the method of verification for checking the time on earth cannot be used to check the time on the sun. Therefore there is no use in explaining the pain of someone else as identical to the pain I feel. Therefore the meaning of “the same pain” in the context of first person assertions cannot depend on a generalization based on intuition by analogy with third person assertions - just as the meaning of “the same time” cannot depend on a generalization based on intuition by analogy with a specific case (it is 5 o'clock) in our standard reference system. As Einstein remarks, the use of intuition may lead us astray, compelling us to make “meaningless” sentences¹⁶. In order to ascertain what “the same time” means, we need to define a method of objective verification. These remnants of verificationism in the *Investigations* date back to the Wittgensteinian attempt to bring Einstein onto his side in 1929, but are already part of a wider vision.

5. Einstein's connection with the Wittgensteinian idea of Grammar

Just after the examples on the meaninglessness of the idea of simultaneity between 5 o’clock on the earth and on the sun, Wittgenstein concludes: “Asking whether and how a proposition can be verified is only a particular way of asking “How d'you mean?” The answer is a contribution to the grammar of the proposition.” (PU 353). This remark is connected with Wittgenstein’s turn in the thirties based on the notion of grammar. In this period Wittgenstein interprets Einstein’s main contribution (“what Einstein taught the world”) in the idea that “the method of measuring time belongs to the grammar of time-expression” (MS 119). Wittgenstein's idea of a grammatical system like “a free-floating calculus which can only be extended but not supported” (BT:112, p.560; PG II, § 16) squarely matches Einstein's view of a scientific system as “a free play with symbols according to (logical) arbitrary given rules of the game”, as Einstein wrote in his discussion of Russell in the “Library of living philosophers” (1944, pp. 287,289).

I shall try to give some support to this superficial connection of citations: the main point of Wittgenstein's grammatical turn is the role of theoretical concepts and rules as free arbitrary creation and a priori part of a system. On this point we find both Einstein and his former pupil Reichenbach on the same side: Einstein agrees with Reichenbach's rediscovery and relativization of Kantian a priori¹⁷; Einstein claims that his own theoretical attitude “is distinct from that of Kant only by the fact that we do not conceive of the 'categories' as unalterable (..) but as (...) free conventions. They appear to be a priori only insofar as thinking without the positing of categories and of concepts in general would be as

¹⁵ The example can be considered a case of discussion of “bridging claims”(Peacocke 1999), where Wittgenstein claims that bridging claims are often misleading. See also Marconi 2002

¹⁶ Einstein-Infeld (1938), p. 182.

¹⁷ We should take care of the differences between Schlick and Reichenbach on this point (see Coffa 1991, chapter 10). But also attention should be given to the different approach taken by Wittgenstein, according to whom the a priori cannot be always reduced to conventions. Beyond the differences, however, we may point out a general agreement of the relevance of the a priori in a new setting compatible with Relativity Theory. On the relations between Reichenbach, Kant, Einstein and the a priori see Friedman 2008.

impossible as breathing in a vacuum”¹⁸. This aspect of the relevance given to the a priori and to the arbitrariness of the rules of a system is greatly developed in Wittgenstein's remarks on the concept of grammar, starting from the mid-thirties. According to Wittgenstein, mathematics is not discovery, but the free invention of concepts. Concept formation marks “the limits of empiricism” (RFM II,71, III,29, VI,14). In a more holistic spirit Wittgenstein claims that understanding a concept means understanding the system of grammar and rules in which it is embedded (PB 108; BT 237; PG II,1, Z,320), an idea which later became a more explicit expression of holism in the motto used by Quine in *Word and Object*: “understanding a sentence means understanding a language”¹⁹. This holistic aspect which is too easily considered in striking contrast with “classical” neopositivism can be more sensibly considered – at least in Wittgenstein – as a further development which stems from early ideas on meaning as verification.

If the last remark is correct, the development of Wittgenstein's thought is useful in reconsidering the relation between Einstein and neopositivism from a wider point of view; Holton (1990) takes for granted – against the “standard” neopositivistic interpretation of Einstein - that Einstein was nearer to Duhem than to the original neopositivistic movement. However we might also stress that the neopositivistic movement cannot be caged in the standard, received view. Certainly, in answering Reichenbach, Einstein explicitly distances himself from the “basic principle” of neopositivism in its “cruder” definition (meaning = verifiability for individual sentences): “Why do the individual concepts which occur in a theory require any specific justification anyway, if they are only indispensable within the framework of the logical structure of the theory, and the theory only in its entirety validates itself?” (Einstein 1949, p. 678). This rhetorical question posed by Einstein to Reichenbach represents a clear, holistic stance which seems to clash with so called “traditional” neopositivism. But – as Haller (1986) has stressed - neopositivism was a richer and more complex movement than normally described, and - beyond the stereotype - some holistic ideas were present from the start: Duhem's work was translated into German in 1908 with an introduction by Mach, and was discussed in the Wiener Kreis much earlier than Quine's “Two Dogmas”²⁰. Schlick himself spoke of the isolated datum as “uninteresting”, and Wittgenstein claimed that it is not a single proposition but an entire system of propositions which is compared to reality (an idea which is considered a forerunner of the later concept of language games)²¹. We cannot say that in these remarks, discussed by the Wiener Kreis, we have an anticipation of Duhem-Quine's holism, but we certainly have a line of thought which is at least coherent with Einstein's remarks against Reichenbach. Wittgenstein's “grammatical turn” can be considered a means to place verificationist ideas within a wider context, inside a holistic vision²².

¹⁸ Einstein 1947, p 674. Actually the discussion with Reichenbach touches upon the question of the verification of individual statements, to point out a criticism of Reichenbach's (and Helmholtz's) idea that geometry is “verifiable”, taking sides with Poincaré for whom geometry is *a priori*. He criticizes Reichenbach's idea, saying that his attack is not on Kant but on the idea of “synthetic *a priori*”. See Einstein 1947, pp. 578-679. On the connection between Reichenbach, the Berlin school of neopositivism and Einstein see Rescher 2006.

¹⁹ The quotation – similar to that in PU 199 – is from the *Blue Book*, (p. 5) and is referred to in Quine 1960 (§16).

²⁰ For the discussion of Duhem in the “first” Wiener Kreis see Haller 1986.

²¹ Schlick 1932: “the meaning of every physical statement is lodged finally in an endless concatenation of data; the isolated datum therefore is uninteresting here. Hence if any positivist ever said that the only objects of science are the given experiences themselves, he was certainly quite mistaken; what alone the scientists seek are the rules which govern the connections among experiences...”; see also Wittgenstein WWK, p.316, PB §§ 81 and 82 on the idea of the “whole system which is compared with reality, not a single proposition”.

²² The starting point of holism in Quine 1961 is linked to Wittgenstein's *Blue Book* at § 16 of *Word and Object* – as said in footnote 19. However this connection has to be taken with some care, given the difference of Quine's form of holism from

Actually, the idea of verification of individual assertions based on *sense data* was briefly considered by both Wittgenstein and Carnap, only to be quickly abandoned (by both). It is difficult to make a clear dividing line between the early ideas and their liberalization, even if Hintikka-Hintikka (1986, ch.6, § 5) give a precise date in October 1929 for Wittgenstein's radical change from phenomenological to physicalistic language (accusing Carnap of stealing his ideas on this point). In 1929 Wittgenstein distinguishes phenomenological language, as the language of sense data, from the language of physics. Reflecting on the idea of the difference between descriptions in phenomenological and physicalistic language, Wittgenstein remarks:

“the theory of Relativity doesn't represent the logical multiplicity of the phenomena themselves, but that of the regularities observed. This multiplicity corresponds not to one verification, but to a law by verification” (PB summary of §230).

Relativity theory takes the role of a scientific law or hypothesis - that is something which cannot be true or false, because it is not verifiable, but it provides a law for formulating verifiable propositions, or, as Schlick stated, following Wittgenstein, “a prescription for the making of assertions”²³. These passages give further support to the idea that one of the sources of Wittgenstein's turn towards a more holistic attitude derives from or is connected with Relativity Theory.

As a provisional conclusion, therefore, we may claim that both strict verificationism and the more holistic phase centered around the notion of grammar are deeply connected with Einstein's ideas. We cannot distinguish a clear break between a “verificationist” phase and a “grammatical” phase; they are connected to each other, and talk of verification progressively merges with talk of grammar.

6. Einstein's impact on rule following considerations

We may speak of Einstein's influence on Wittgenstein's later work starting from 1938. It is precisely from this period that Wittgenstein begins to speak of shrinking rods (see part I of RFM); it looks as if Wittgenstein is “toying” with Einstein's mental experiments for his own purposes: while Einstein's rigid rods shrink in the direction of motion but with no contraction in the direction perpendicular to the motion (Einstein 1916, ch. 12 and 23; Einstein-Infeld 1938, p.190) Wittgenstein's rigid rods made of hard material shrink when brought out of the horizontal into the vertical, or they bend if one brings a certain mass near them (RFM I/118). Wittgenstein suggests circumstances where it might be practical to have a ruler that shrinks when displaced, a property which could make the ruler useless in other circumstances (RFM I/140).

There is probably some connection with Einstein's mental experiments on shrinking rods, although the similarity is not followed through to an explicit comparison. Yet we know that 1938 was a turning point in Wittgenstein's work - he renounced the publication of his book, both for internal reasons of dissatisfaction and for external reasons (the strong negative impact the *Anschluss* had upon him). He was probably dissatisfied with the treatment of the problem of rule-following, which originated in the debate on the foundation of mathematics, and was placed in a more general discussion on the mastery of our

Wittgenstein's quasi-holistic attitude. See Penco (2004).

²³ I owe this connection between Wittgenstein and Schlick on the idea of hypothesis and scientific laws to Hymers 2005.

conceptual apparatus²⁴. Later, in the early forties, just after quoting, again, the idea of a similarity between his ideas and Relativity Theory (see the citation at the beginning of this paper), Wittgenstein comments:

“Is $25^2=625$ a fact of experience? You'd like to say: ‘No’ Why isn't it? ‘Because, by the rules, it can't be otherwise.’ And why so? - Because that is the meaning of the rules. Because that is the procedure on which we build all judging.” (RFM VI,28).

These remarks follow a long discussion on what a proof is, and what it is to follow a step in a proof (the basic case of rule following). Wittgenstein distinguishes the justification of a proposition from its role: on the one hand we might look for a *justification* by explaining learning and training and the “normal circumstances” in which a rule is applied or a calculation (like $25^2=625$) is performed (with no reference to mental facts as grounds for justification); on the other hand, the *role* of the proposition $25^2=625$ is to serve as a “paradigm for judging experience” (RFM VI, 22-23; VII, 26). We cannot coherently imagine that we might have always gone wrong in a calculation without realizing it. If we were to go wrong we would realise what had happened and we would need to have another set of rules. Wittgenstein comes back to this precise problem (we *cannot* have gone wrong) in his later remarks on certainty, commenting: “Here once more there is needed a step like the one taken in relativity theory”²⁵. In the context of *On certainty* “once more” might be interpreted as: let us again take Einstein's view as we have done with the idea of verificationism and of grammar. The context of the discussion is the impossibility of error in calculation, as in the above quoted passages from *Remarks on the Foundation of mathematics*. It appears that Wittgenstein is suggesting that his discussion on certainty, too, is linked to the main core of Einstein's revolution.

Why, then, is there the reference to Einstein in *this* connection, that is in connection with the debate on certainty in using our paradigmatic cases of calculation? Einstein's work was devoted not to defining events but to clarifying the role of our measuring tools and the difference in their behaviour in different coordinate systems, such as spatio-temporal effects. He discusses the working of clocks which behave “rigidly” inside one coordinate system, but appear to slow down in another coordinate system which approximates the speed of light. The rigidity of yardsticks and of clocks permits a description inside one coordinate system while invariants and general transformational rules permit comparison between different coordinate systems. It seems that remarks and examples from special relativity are the main source of Wittgenstein's move in his later period; his stress on the “similarity” between his ideas and Relativity Theory may be expressed as the following: just as physical laws are not descriptions of events or phenomena, but are descriptions of relations between our measuring tools, so philosophical remarks are not remarks on facts of

²⁴ Especially significant is Wittgenstein's reaction against intuitionism in his 1939 lectures; The general understanding of philosophy as grammar was not enough to answer the search for certainty of the different foundational schools, mainly of the intuitionistic school, which had previously made a good impression on Wittgenstein. Brouwer claimed that we need an intuition at each step of a proof, and Wittgenstein eventually strongly reacted against this. In his lectures of '39 he is reported to have said “We may as well say that we need not an intuition at each step, but a decision – Actually there is neither. You don't make a decision: you simply do a certain thing. It is a question of a certain practice” (LFM, p. 237). This is one of the few concerns which makes it difficult to accept Wright's interpretation of rule following, which is partly based on the idea of “decision”. Another aspect is that Wittgenstein claims that rule following grounds our judgements: the meaning of the rule is the procedure “on which we build all judging.” (RFM VI,28); being the ground for judging, rule following cannot be judgement-dependent. See Penco1994, and Wilson 1994 for an interpretation of rule following more compatible with this analysis.

²⁵ UG 305; see UG 303-305; cfr 46-49 see also RFM III,73.

language, but rather on the relations between the tools we use in language. As Wittgenstein says concerning colors: “the certainty with which I call the colour ‘red’ is the rigidity of my measuring rod, it is the rigidity from which I start” (RFM VI,28). The point here is that we need to study the paradigmatic role of our conceptual apparatus (mathematical rules, color terms), which allow our description of facts (“mathematics teaches us what a fact is”). But our conceptual tools are to be placed in a general framework given by the ability of rule following. It is as if rule following takes, in respect of different conceptual systems, the same foundational role that invariant laws have in Einstein's relativity theory: a tool by means of which we may make comparisons among different systems.

In his last phase Wittgenstein therefore inserts two novelties: on the one hand, as Einstein's remarks concern the clocks with which we compare events, Wittgenstein's remarks are considerations on the concepts and rules with which we describe facts and events. Our concepts are tools: as measuring rods or clocks are used to compare events, so we use our concepts to describe situations; we use them “rigidly” inside our “normal” language games, *but we should expect them to behave differently in different language games*, like Einstein's rods which appear to shrink in different coordinate systems. On the other hand, like Einstein's systems of equations for different coordinate systems, the activity of rule following constitutes a general framework within which it is possible to compare different language games.

These two aspects of the final “similarity” Wittgenstein found with Einstein might be expressed as follows: as we do not question the rigidity of our clocks, we do not question the rigidity of our conceptual apparatus, even if we may imagine situations in which it might change, as we may imagine our clocks slowing down relative to certain coordinate systems. However, as we use physical invariants and systems of transformation for comparing different coordinate systems, we may find in the human ability of rule following the universal medium through which we may compare different cultural systems. These two aspects may be of help in better understanding much of Wittgenstein's use of so-called mental experiments, or alien language games, and the contrast between their relativist or transcendentalist interpretations (see Penco 2008).

7. Conclusion

I have not yet spoken of the first kind of citation given above in § 2, where Wittgenstein says: “In the ‘not being able to go beyond themselves’ we find the similarity between my observations and those of the Relativity Theory”. Actually this remark seems apparently linked to the main ideas of the *Tractatus* with its anti- metalinguistic attitude. This quotation is one of the first quotations on Einstein after Wittgenstein returned from the war (in MS 108), and – if our cursory analysis of Wittgenstein's comments on Relativity theory makes sense – it helps to show our philosopher continuously re-shaping his interpretation of the connection between Einstein and his evolving ideas, starting with the core line of the *Tractatus* and progressively widening the comparison towards new themes, from verificationism, to grammar, rule following considerations and certainty. This evolution shows Wittgenstein's attempts to change his interpretation of Einstein's similarity with his own thought in parallel with the development of his philosophy.

The strict connections Wittgenstein tries to make between Relativity Theory and his major changes subsequent to the *Tractatus* (verificationism, grammar and rule following considerations) offer us a highly remarkable situation. It seems that Wittgenstein, fascinated

by the most significant discovery of the century, tries to stay in touch with it while developing his own ideas. In the same way that Kant was the philosopher of Newton, even if in his main works he did not discuss many of the details of Newtonian Physics, so Wittgenstein understood the significance of Einstein's revolution and wanted to take part in it. Was it a real influence of Relativity Theory or just an attempt to find a superficial similarity? Although there is no clear cut answer, my impression, reflected in what I have written here, tends more towards the former than the latter.

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- RFM = *Remarks on the Foundation of Mathematics* [*Bemerkungen über die Grundlagen der Mathematik*]. Oxford: Blackwell, 1978 (Third edition).
- BT= *The Big Typescript*, TS 213. Edited and translated by G. G. Luckhard and M. A. E. Aue, Oxford: Blackwell 2005
- LFM = *Wittgenstein's Lectures on the Foundation of Mathematics, Cambridge, 1939*. Ed. Cora Diamond, Ithaca: Cornell U.P. 1976.
- N = *Nachlass*. Berggen Electronic Edition, Oxford: Oxford University Press, 2000.
- PB = *Philosophische Bemerkungen*, Oxford: Blackwell 1964 (Engl.transl. 1975).
- PU = *Philosophische Untersuchungen*, translated by G.E.M. Anscombe, Oxford: Blackwell 1968.
- TLP = *Tractatus Logico-Philosophicus*. London: Routledge & Kegan Paul, 1921.
- UG = *Über Gewissheit*. Oxford: Blackwell, 1974.
- VB = *Vermischte Bemerkungen*. Edited by Von Wright, Frankfurt aM, 1977.
- Z = *Zettel*. Oxford: Blackwell, 1967.