

## POPPER VERSUS WITTGENSTEIN ON TRUTH, NECESSITY, AND SCIENTIFIC HYPOTHESES

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**SUMMARY.** Most philosophers of science maintain Confirmationism's central tenet, namely, that scientific theories are probabilistically confirmed by experimental successes. Against this dominant (and old) conception of experimental science, Popper's well-known, anti-inductivistic Falsificationism ('Deductivism') has stood, virtually alone, since 1934. Indeed, it is Popper who tells us that it was he who killed Logical Positivism. It is also pretty well-known that Popper blames Wittgenstein for much that is wrong with Logical Positivism, just as he despises Wittgenstein and Wittgensteinian philosophers for abdicating philosophy's true mission. What is not well-known, however, especially because Popper neglected to tell us in 1934, is that Wittgenstein is very much an ally. It was Wittgenstein who rejected induction in the strongest possible terms as early as 1922, and it was Wittgenstein who similarly rejected Confirmationism approximately four years prior to Popper. The aims of this paper are to illuminate the substantial agreements between Popper and Wittgenstein and, by doing so, to clarify their important disagreement regarding the status of "strictly universal," scientific theories (or hypotheses).

*Key words:* Popper, Wittgenstein, induction, Confirmationism, hypotheses, necessity, finitism

Strong Verificationism is long dead, but its successor and corrector, Confirmationism, is anything but deceased. Most philosophers of science maintain Confirmationism's central tenet, namely, that scientific theories are confirmed by experimental successes. On this view, our best scientific theories are those with the highest degree of confirmation – those with the highest *probability of being true*. Scientific theories are distinguished from non-scientific theories not by their verifiability, according to Confirmationism, but by their experimental confirmability. Propositions that are not confirmable by experiment *or* by direct empirical observation are simply not scientific propositions.

Against this dominant (and old) conception of experimental science, Popper's well-known, anti-inductivistic Falsificationism ('Deductivism') has stood, virtually alone, since 1934. Indeed, it is Popper who tells us that it was he who killed Logical Positivism.<sup>1</sup> It is also pretty well-known that



Popper blames Wittgenstein for much that is wrong with Logical Positivism, just as he despises Wittgenstein and Wittgensteinian philosophers for abdicating philosophy's true mission.<sup>2</sup> What is not well-known, however, especially because Popper neglected to tell us in 1934,<sup>3</sup> is that Wittgenstein is very much an ally. It was Wittgenstein who rejected induction in the strongest possible terms as early as 1922, and it was Wittgenstein who similarly rejected confirmationism approximately four years prior to Popper. The aims of this paper are to illuminate the substantial agreements between Popper and Wittgenstein and, by doing so, to clarify their important disagreement regarding the status of "strictly universal," scientific theories (or hypotheses).<sup>4</sup>

### 1. TWO DIFFERENT CONCEPTIONS OF PHILOSOPHY

Popper has informed us, *ad nauseam*, that he abhors linguistic philosophy in all of its forms.<sup>5</sup> Not only is this true, it would be a gross distortion to paint Popper and Wittgenstein as allies without first noting this crucial disagreement. For the most part, Popper's principal concerns are epistemological,<sup>6</sup> whereas Wittgenstein's principal concerns are linguistic. Where, for example, Wittgenstein says "[my] method consists essentially in leaving the question of truth and asking about sense instead,"<sup>7</sup> Popper "sum[s] up [his] position by saying that, while theories and the problems connected with their truth are all-important, words and the problems connected with their meaning are unimportant."<sup>8</sup>

However, just as Popper cannot and does not avoid the philosophy of language and linguistic distinctions,<sup>9</sup> Wittgenstein is not *solely* concerned with questions of sense. Wittgenstein's concern with logic prompts him to reject logical induction, and his concern with knowledge, together (perhaps) with his adherence to the Correspondence Theory of Truth, compels him to resolve the problem of the status of strictly universal, scientific theories in a way markedly at odds with Popper's resolution.

### 2. POPPER'S CRITIQUE OF WITTGENSTEIN

In his *The Logic of Scientific Discovery* (first published in 1934 as *Die Logik der Forschung*; hereafter '*LSD*'), Popper attacks a view on scientific theories (and hypotheses) which he attributes to Wittgenstein. The first part of this view Popper *correctly* attributes to Wittgenstein's *Tractatus* (hereafter '*TLP*'), namely the view that "every meaningful proposition must be *logically reducible* to elementary (or atomic) propositions"<sup>10</sup> –

this is a correct attribution provided that we construe this to mean that every meaningful or genuine proposition is a truth-function of one or more 'elementary' (or atomic) contingent propositions.<sup>11</sup> The second part of the view Popper attributes to Wittgenstein on the basis of a personal communication with Moritz Schlick.<sup>12</sup> This is the "idea of treating scientific laws as pseudo-propositions – thus solving the problem of induction,"<sup>13</sup> since, as Schlick put it, "a natural law... does not have the logical character of a statement, but is, rather, a prescription for the formation of statements." Popper rejects this solution or dissolution of the problem of induction, saying that "Wittgenstein's criterion of meaningfulness" "comes to grief," since, "[i]f consistently applied, Wittgenstein's criterion of meaningfulness rejects as meaningless those natural laws the search for which, as Einstein says, is 'the supreme task of the physicist.'" Since, according to Popper, "Wittgenstein's criterion of meaningfulness coincides with the inductivists' criterion of demarcation" ("between the empirical sciences on the one hand, and mathematics and logic as well as 'metaphysical' systems on the other"<sup>14</sup>), Popper rejects it for two reasons: (1) because it eliminates "scientific laws" from the body of meaningful propositions, *and* (2) because it is a failed "attempt to solve the problem of demarcation," since it throws the baby (i.e., scientific theories) out with the bathwater (i.e., metaphysical (pseudo)-propositions).

### 3. FUNDAMENTAL AGREEMENTS BETWEEN WITTGENSTEIN AND POPPER

To properly understand and evaluate Popper's criticisms, we must first look at some rather large and striking agreements between Wittgenstein and Popper. Most important by far is the fact that Popper and Wittgenstein *agree* that a strictly universal hypothesis or theory *cannot be verified for logical reasons*. A strictly universal theory, says Popper, is "a universal assertion about an unlimited number of individuals," which "claims to be true for any place and any time"<sup>15</sup> – it is, as Wittgenstein puts it,<sup>16</sup> 'infinite' in that it is 'openended.'<sup>17</sup> As such, a theory cannot be verified by a finite number of observations, first because it is not equivalent to a finite conjunction,<sup>18</sup> and second, and more importantly, it cannot be inductively inferred from a finite number of observation statements because induction cannot be justified. Wittgenstein makes the latter crystal clear in the *Tractatus*, saying explicitly and unequivocally (TLP 6.363–6.3631) that "[t]he procedure of ['logical'] induction" "has no logical justification but only a psychological one."<sup>19</sup> "There is no compulsion making one thing happen because another has happened," he stresses (6.37) – "[t]he only

necessity that exists is *logical necessity*” (i.e., truth-functional necessity).<sup>20</sup> “It is an hypothesis that the sun will rise tomorrow,” says Wittgenstein (6.36311), “and this means that we do not know whether it will rise.” In his *LSD*, Popper similarly says that if “*the problem of induction*” is understood as “[t]he question whether inductive inferences are justified,” then the answer is clearly ‘No,’ for “no matter how many instances of white swans we may have observed, this does not justify the conclusion that *all swans are white*.”<sup>21</sup>

Furthermore, both Wittgenstein and Popper regard an appeal to a “principle of induction” (Popper) or “[t]he so-called law of induction” (Wittgenstein) as hopeless, for we cannot *justify* inductive inferences by appealing to such a law or principle “since it is obviously a proposition with sense” (Wittgenstein, TLP 6.31), which means, as Popper puts it, that “the principle must be a synthetic statement; that is, a statement whose negation is not self-contradictory but logically possible.”<sup>22</sup> Whether such a proposition is formulated as a law/principle of induction or as a law/principle of causality, since it is synthetic, its invocation either begs the question or leads to an infinite regress.

In addition to these two major agreements, Popper and Wittgenstein also agree on six other important theses. First, and most notably, they both maintain The Correspondence Theory of Truth for scientific statements.<sup>23</sup> Second, Wittgenstein, like Popper, is a realist, as is evidenced when he says that “[d]escribing phenomena by means of the hypothesis of a world of material objects is unavoidable in view of its simplicity when compared with the unmanageably complicated phenomenological description.”<sup>24</sup> Third, both Popper and Wittgenstein assert that science *uses* universal hypotheses to make predictions. Fourth, they both claim that an hypothesis is *not* made *more probably true* by passing numerous tests without failure.<sup>25</sup> Fifth, though Wittgenstein says nothing about falsifiability in the *Tractatus*, in *Philosophical Remarks* he clearly states that “[c]ertain possible events must contradict the law [universal hypothesis] if it is to be one at all” and something is “only a natural law if it can be confirmed by a particular experiment, and also refuted by a particular experiment.”<sup>26</sup> Given that Popper defines a “basic statement” as a singular, “strictly existential statement” that refers to an “observable *occurrence*,”<sup>27</sup> and given that a “theory rules out certain possible occurrences,” both Wittgenstein and Popper stipulate that a universal hypothesis must ‘contradict’ or ‘rule out’ “possible occurrences” or “possible events.”

For our purposes, the last major point of agreement between Popper and Wittgenstein is that they both claim that *if* an hypothesis has passed many

tests without failing any, we become, methodologically and practically, more unwilling to give it up. Wittgenstein puts the matter this way:

The probability of an hypothesis has its measure in how much evidence is needed to make it profitable to throw it out. It's only in this sense that we can say that repeated uniform experience in the past renders the continuation of this uniformity in the future probable. If, in this sense, I now say: I assume the sun will rise again tomorrow, because the opposite is so unlikely, I here mean by 'likely' and 'unlikely' something completely different from what I mean by these words in the proposition 'It's equally likely that I'll throw heads or tails'. The two meanings of the word 'likely' are, to be sure, connected in certain ways, but they aren't identical.<sup>28</sup>

Wittgenstein's point about "The probability of an hypothesis" and the profitability of rejecting it (i.e., refutation) is that, *if* an hypothesis has "proved its mettle" (as Popper puts it<sup>29</sup>), we will not reject it on the basis of one or two experimental counter-examples, for we often encounter a few such counter-examples or, what Popper calls, "occult effects." That is to say, we require *more* counter-evidence to throw out a well-confirmed hypothesis (i.e., a "well-corroborated" hypothesis) than we do to throw out a brand-new, hitherto untested, hypothesis, since we are 'comfortable' using the former, partly because it is a part of a larger, presumably logically consistent, 'whole' (or set) of hypotheses and propositions. Like Wittgenstein, Popper says that we only ("tentatively") reject an hypothesis if (a) we 'accept' "basic statements" (i.e., observation statements) that contradict it, and (b) these basic statements 'corroborate' a (proposed) falsifying hypothesis (i.e., a low-level empirical hypothesis, which describes a "reproducible effect").<sup>30</sup> In further agreement with Wittgenstein, Popper also adopts an integrated, if not holistic, approach to prediction generation and hypothesis testing, as is indicated by his early (1934) admission that the Duhem-Quine thesis is fundamentally unassailable (i.e., being only a *reminder* that *modus tollens* does not single out a particular proposition as false if the antecedent of the relevant conditional is a conjunction).<sup>31</sup>

#### 4. DISAGREEMENT: THE STATUS OF A STRICTLY UNIVERSAL THEORY

Given all of this agreement, how is it that Wittgenstein and Popper seem to *disagree* about the status of a strictly universal theory? What, at bottom, gives rise to this disagreement? The answer, in short, is that Popper *believes* that a universal theory can be true because he *believes* that natural laws exist, whereas Wittgenstein rejects "the causal nexus" and asserts that we *cannot believe* that a regularity will continue infinitely because we cannot have any grounds for such a belief. What obscures this fundamental

disagreement is that *both* Wittgenstein and Popper *seem* to grant a *general human belief in the uniformity of nature*. In *LSD*, Popper famously says:

*We do not know: we can only guess.* And our guesses are guided by the unscientific, the metaphysical (though biologically explicable) faith in laws, in regularities which we can uncover – discover. Like Bacon, we might describe our own contemporary science – ‘the method of reasoning which men now ordinarily apply to nature’ – as consisting of ‘anticipations, rash and premature’ and of ‘prejudices’.<sup>32</sup>

About three years earlier, Wittgenstein writes that “[t]he nature of the belief in the uniformity of events is perhaps clearest in a case where we are afraid of what we expect to happen. Nothing could persuade me to put my hand in the fire, even though it’s *only in the past* that I’ve burnt myself.”<sup>33</sup> Popper and Wittgenstein both maintain that this belief in the uniformity of nature can *at best* be formulated as the statement “There are laws of nature” (TLP 6.36), which both agree is a *metaphysical* statement, since it is *synthetic* and neither verifiable nor falsifiable. What they disagree about is whether it is a genuine proposition: Wittgenstein says ‘No,’ Popper says ‘Yes.’ The received view about this is that Wittgenstein says ‘No’ *simply* because it is ‘metaphysical,’ which *means* it is meaningless (TLP 6.36: “But of course that [‘There are laws of nature’] cannot be said: it makes itself manifest.”). The received view of Wittgenstein’s position is certainly Popper’s view also,<sup>34</sup> but, as I shall now argue, it is far too simplistic: it makes Wittgenstein’s view appear untenable, when, in fact, *on Popper’s own terms*, it is at least equally as plausible as the standard view.

The crucial difference here is that, although Popper and Wittgenstein agree that human beings generally believe that there is uniformity in nature, they *disagree* about what this means for the status of a universal theory. In the *Tractatus*, Wittgenstein clearly says (5.135) that “[t]here is no possible way of making an inference from the existence of one situation to the existence of another, entirely different situation” – that “[w]e *cannot* infer the events of the future from those of the present” (TLP 5.1361) – *because* “[t]here is no causal nexus to justify such an inference” (TLP 5.136). The only way that we could *justifiably infer* the *truth* of a “future contingent” or a universal theory would be if (a) there existed a causal nexus, *and* (b) we *knew* that a particular regularity was a genuine, physically necessary, law of nature. In his intermediate period, Wittgenstein elaborates this view by saying that universal hypotheses are *not* genuine propositions because they “can’t be definitively verified,” which means they “can’t be verified at all” – that “there’s no truth or falsity for [them].”<sup>35</sup>

When I say an hypothesis isn’t definitively verifiable, that doesn’t mean that there is a verification of it which we may approach ever more nearly, without ever reaching it. That is nonsense – of a kind into which we frequently lapse. No, an hypothesis simply has a

different formal relation to reality from that of verification. (Hence, of course, the words 'true' and 'false' are also inapplicable here, or else have a different meaning.)<sup>36</sup>

For Wittgenstein, an hypothesis is not a genuine proposition with a definite truth-value, but rather "a law for forming propositions," or "a law for forming expectations."<sup>37</sup>

Popper, as we know, agrees with Wittgenstein (and Hume) that (a) and (b) are both *necessary* to justify an inference to a future contingent or a universal theory. Popper *disagrees* with Wittgenstein, however, in claiming that strictly universal theories can be true by correspondence, which he asserts on the grounds that there *exist physically necessary laws of nature* (what Wittgenstein calls "the causal nexus").<sup>38</sup> Strictly universal theories can be true by correspondence *only if* there are "structural regularities" (i.e., physically necessary laws of nature) which are "built-in" the world.<sup>39</sup> Though the claim that such laws exist "is a conjecture of a metaphysical cosmology,"<sup>40</sup> Popper states that he personally 'believes' that physically necessary natural laws exist,<sup>41</sup> and, moreover, that "the metaphysical... faith in laws" is a "psychological presupposition" of our search for laws, though neither we nor our methodology 'presupposes' or 'assumes' that such laws exist.<sup>42</sup>

Most importantly for our purposes, however, is the fact that, in 1934, Popper (correctly) grants that "the question whether the laws of science are strictly or numerically universal cannot be settled by argument."<sup>43</sup> "It is one of those questions which can be settled only by an agreement or a convention," Popper continues, "[a]nd in view of the methodological situation... I consider it both useful and fruitful to regard natural laws as synthetic and strictly universal ('all-statements')."

Three years prior,<sup>44</sup> Wittgenstein disagrees on both counts. On the latter front, Wittgenstein grants that a universal theory "can bring us to make certain observations" and "determine certain actions," but he stresses that "a finite prediction would always have done equally well."<sup>45</sup> Thus, contrary to Popper's claim, Wittgenstein asserts that it is *not* more methodologically 'useful' or 'fruitful' to regard scientific theories as strictly universal statements. On the former front – i.e., *believing* that physically necessary natural laws exist – Wittgenstein says that if we say of a regularity 'I believe it will go on like that for ever' (e.g., "I believe 'This comet will move in a parabola with equation...' forever"), "we must ask: Can there be grounds for this belief?" The question "what are the grounds for the infinite assumption?!" has no answer, Wittgenstein argues, which makes the statement "I suspect it will go on without end' so comic," "[f]or we want to say it's senseless to say you suspect that: because it's senseless to talk of grounds for such a suspicion."<sup>46</sup> But if it is senseless to speak

of grounds for believing in a *particular* infinite regularity, then, contra Popper, it is equally senseless to speak of grounds for *believing* that even one such regularity exists.

Ironically, Popper says:

It is clear that on any such view of natural laws which obliterates the distinction between singular and universal statements [by requiring “that every synthetic universal statement must in principle be translatable into a conjunction of a finite number of singular statements”], the problem of induction would seem to be solved; for obviously, inferences from singular statements to merely numerically universal ones may be perfectly admissible. But it is equally clear that the methodological problem of induction is not affected by this solution. For the verification of a natural law could only be carried out by empirically ascertaining every single event to which the law might apply, and by finding that every such event actually conforms to the law – clearly an impossible task.<sup>47</sup>

Popper here grants that Wittgenstein’s finitism as regards scientific theories solves “the logical problem of induction,” but *not* “the methodological problem of induction” because it is *practically* impossible to verify a reasonably large, numerically universal theory. But in granting that Wittgenstein solves the *logical* problem of induction, Popper is granting a great deal, and not only because he takes such pride in solving it himself. Minimally, Popper here grants that Wittgenstein’s finitism is plausible, useful, and at least as fruitful as his own methodological falsificationism, since Wittgenstein does *not* require the verification of scientific theories, but only, like Popper, that an hypothesis (“natural law”) “can be confirmed [‘corroborated’] by a particular experiment, and also refuted by a particular experiment.”

##### 5. REALISM, CORRESPONDENCE, ANTI-INDUCTIVISM, AND FINITISM

Which brings us to our final, and most important, question: Is Wittgenstein’s finitism *more* plausible (and perhaps more useful and more fruitful) than Popper’s Falsificationism? More specifically, is the *rejection* (rather than the acceptance) of strictly universal ‘propositions’ more compatible with the Wittgensteinian-Popperian acceptance of realism, anti-inductivism, and the Correspondence Theory of Truth? My answer is ‘Yes,’ though the applicability of this answer to Wittgenstein is based upon a conjecture as to how Wittgenstein would respond to Popper’s ‘admission’ that Wittgenstein solves the logical problem of induction. The conjecture is this. Just as Wittgenstein regards strictly universal theories as non-propositions, he similarly regards future contingents and numerically universal theories which *contain* future contingents as non-propositions. For Wittgenstein, an expression is a proposition iff it can be true by correspondence



to facts. Present-tensed statements are, therefore, propositions, as, presumably, are past-tensed statements. Future-tensed statements, however, can neither correspond nor fail to correspond to non-existent future facts. Given that physical necessity does not exist (or given that the existence of physical necessity is undecidable, as Popper grants), it therefore makes no sense to speak of truth as regards future contingents or numerically universal theories that contain future contingents. Though it is logically possible to verify *some* numerically universal theories by verifying each conjunct at the appropriate time (which means that these numerically universal theories are true or false propositions as *past*-tensed statements), this provides no warrant for speaking of true future contingents. On this construal, verifiability is one plank in Wittgenstein's philosophy of science, but the Correspondence Theory of Truth and Wittgenstein's rejection of physical necessity are far more fundamental.

On Wittgenstein's account, he and Popper have grounds for speaking of a correspondence with past and present facts, but not for speaking of a correspondence with future facts *or* with physically necessary laws. We do *use* (either strictly or numerically) universal theories in science, but there is absolutely no need to say, and, indeed, no advantage in saying, that they are true or false or in claiming that the hallmark of science is its relentless attempt to ascertain which strictly universal theories are false (since it is senseless to speak of *true*, strictly universal theories). Popper is simply mistaken in saying that it is "useful and fruitful to regard natural laws as... strictly universal" statements, since we can behave exactly as scientists do *without* regarding "strictly universal statements" as genuine (i.e., true or false) contingent propositions. Thus, it is just plainly false to say that "Wittgenstein's criterion of meaningfulness" "comes to grief" because it "rejects as meaningless [strictly universal] natural laws," since Popper himself grants that "whether the laws of science are strictly or numerically universal cannot be settled by argument." It follows that the instrumentalism Popper so much despises<sup>48</sup> – the instrumentalism that treats universal theories as *tools* for prediction – is at least as plausible as Falsificationism, but with the *decided advantage* that science isn't essentially neurotic, trying to *identify* (i.e., "search for") *true* universal theories while admitting that it cannot do so. If Wittgenstein is right (as Popper seemingly admits), we have no justification for speaking of – or searching for – true, strictly universal theories.

## NOTES

<sup>1</sup> Karl Popper, "Intellectual Autobiography," in Paul A. Schilpp (ed.), *The Philosophy of Karl Popper* (La Salle, Illinois: Open Court, 1974), p. 69.

<sup>2</sup> See, e.g., Popper's "Science: Conjecture and Refutations," pp. 39-40 and 55; "The Nature of Philosophical Problems and Their Roots in Science," pp. 67-74; and *Quantum Theory and the Schism in Physics*, Footnote #23. See also Karl Popper, "Intellectual Autobiography," pp. 97-99, for Popper's account of the famous "poker incident," in which, while delivering "Are There Philosophical Problems?" to the Moral Science Club at Cambridge (October 25, 1946), Wittgenstein and Popper vehemently argued about the existence of philosophical problems. This incident (including various similarities and differences between Popper and Wittgenstein) has recently been revisited by David Edmonds and John Eidinow, *Wittgenstein's Poker* (London: Faber and Faber, 2001), prompted by yet another explosion over the poker incident after Popper's death in 1994.

<sup>3</sup> Though Popper criticizes specific *Tractarian* claims in 1934 (e.g., *The Logic of Scientific Discovery* [hereafter 'LSD'], pp. 36, 51) – esp. (*Tractatus Logico-Philosophicus* [hereafter 'TLP'] 6.363) at LSD, p. 138 – he makes no reference to TLP 6.3631, 6.36311, and 6.31. Even in the "New Appendices," added in 1959, when Popper quotes (TLP 6.37; see Endnote #19, below), he fails to mention TLP 6.3631 and TLP 6.36311.

<sup>4</sup> A "strictly universal statement" or 'theory' is defined (by Popper) in Section 3.

<sup>5</sup> See, e.g., the 1958 Preface to the 1959 edition of LSD, pp. 15–23.

<sup>6</sup> See Ray Monk, *Bertrand Russell: The Ghost of Madness* (New York: The Free Press, 2001) for Russell's similar *epistemological* concerns during the 1930's.

<sup>7</sup> Ludwig Wittgenstein, *Culture and Value* (Oxford: Basil Blackwell, 1998 [1994, second edition]), p. 3; (MS 105 46 c: 1929\*).

<sup>8</sup> Karl Popper, *The Logic of Scientific Discovery* (1959), *Addendum*, 1968, p. 441.

<sup>9</sup> See, e.g., LSD, p. 64: "I consider the distinction between universal and individual concepts or names to be of fundamental importance." See also Popper's 1958 Preface to LSD, p. 17, where he says that the "replacement of Locke's 'new way of ideas' by a 'new way of words' [the so-called "linguistic turn"] was an advance, and one that was urgently needed."

<sup>10</sup> Karl Popper, LSD, p. 36.

<sup>11</sup> Popper's original LSD statement (p. 36) of Wittgenstein's *Tractarian* position does *not* construe "atomic propositions" as "observation statements," but in his 1933 letter to the Editor of *Erkenntnis*, Popper *wrongly* equates "'atomic' propositions" and "singular observation statements" (LSD, p. 313), as he does in "Science: Conjecture and Refutations" (p. 39), where he equates 'atomic facts' with "facts which can in principle be ascertained by observation."

<sup>12</sup> It might be thought that Popper *directly* criticizes Wittgenstein's *Tractatus* when he says (LSD, p. 36) that, according to Wittgenstein, "every meaningful proposition must be *logically reducible* to elementary (or atomic propositions)" and when he says (LSD, p. 63) that his view "stands opposed to the view that every synthetic universal statement must in principle be translatable into a conjunction of a finite number of singular statements." This reading would, however, be mistaken, first, since Popper attributes finitistic reductionism to "F. Kaufman" (LSD, p. 63, Ft. #2) and, second, because, in the *Tractatus* Wittgenstein does not require that logical products be finite (see, e.g. TLP 4.2211). Only in 1929-30 does Wittgenstein say (*Philosophical Remarks* [hereafter 'PR'] §127): "If no finite product makes a proposition true, that means *no* product makes it true. And so it *isn't* a logical product."

<sup>13</sup> LSD, p. 36, Ft. # \*4.

<sup>14</sup> *LSD*, p. 34.

<sup>15</sup> *LSD*, pp. 62–63.

<sup>16</sup> *PR*, p. 311.

<sup>17</sup> One of Popper's examples is: 'Of all points in space and time (or in all regions of space and time) it is true that. . .,' *LSD*, p. 63; one of Wittgenstein's examples is: 'This comet will move in a parabola with equation...,' *PR*, p. 311. Both Popper and Wittgenstein contrast a strictly universal theory with a proposition that, as Popper states it (*LSD*, p. 63), "relate[s] only to certain finite regions of space and time."

<sup>18</sup> See *LSD*, pp. 62–63: "So interpreted it clearly cannot be replaced by a conjunction of a finite number of singular statements."

<sup>19</sup> As I mentioned in Endnote #3, though Popper quotes, cites, and criticizes Wittgenstein's *Tractatus* in *LSD*, including especially TLP 6.363 (*LSD*, p. 138), he completely ignores the rather striking TLP 6.3631, just quoted. Given the proximity of TLP 6.3631 and Popper's anti-inductivism in *LSD*, one might justifiably wonder why Popper did not quote or mention TLP 6.3631 in the original *Logik der Forschung*. Much later, in the English translation, *LSD*, Popper says (Appendix \*x: "Universals, Dispositions, and Natural or Physical Necessity," 1959, p. 438: "I largely agree with the spirit of Wittgenstein's paraphrase of Hume: 'A necessity for one thing to happen because another has happened does not exist. There is only logical necessity.'" [Popper gives this as TLP 6.3637 in Ft. #22, but there is no such numbered item. This passage is numbered 6.37. Also, 'logical' is italicized in TLP, but not in Popper's quotation.] On p. 96 of "An Afterthought on Induction" ("Two Faces of Common Sense," 1970, 1972), Popper says: "But Hume must be credited with the formulation of the pure logical problem of induction and its solution (and I am proud that, as far as I know, I was the first to credit him with it)." However, on p. 95 of the same paper, Popper says "Hume himself confused the problem of induction with the problem of the necessary connection between cause and effect; . . ." What Popper is saying in these passages, on a fair construal, is that Wittgenstein had read Hume and was paraphrasing him, that he (Popper) was "the first to credit [Hume]" with this (negative) 'solution' of the problem of induction, and that, for the most part, Hume conflated the problem of induction with the problem of causal necessity. Thus, not only is Popper accusing Wittgenstein of paraphrasing Hume without citation, he inadvertently (i.e., logically) implies that Wittgenstein *must* have been able to extract *the good solution to the problem of induction* from his reading of Hume!

<sup>20</sup> When C.K. Ogden sent Wittgenstein the original translation of the *Tractatus*, Ogden (perhaps with Frank Ramsey's help) had translated the original German of 5.1361 as "Belief in the causal nexus is superstition," but Wittgenstein replied that the translation 'isn't right. It ought to be: "Superstition is the belief in the causal nexus". I didn't mean to say that the belief in the causal nexus was one amongst superstitions but rather that superstition is nothing else than the belief in the causal nexus. In the German this is expressed by the definite article before "Aberglaube". Wittgenstein's claim may strike some as false *because* it goes too far – thereby eliminating a distinction between belief in a particular (or general) causal relation and a ('superstitious') belief in a causal relation either based on too little evidence or contrary to the evidence – but what is very clear is that Wittgenstein *strongly* rejects *causal* necessity.

<sup>21</sup> *LSD*, p. 27. See also p. 42, where Popper speaks of "Hume's realization of the inadmissibility of inductive arguments." In "An Afterthought on Induction," p. 96, Popper says: "The formulation [in Hume's *Treatise*, Bk. I, Part III, section vi, p. 89] is also perfectly free from the confusing element of the inference from the past to the future." "Hume's answer is as clear as can be: there is no argument or reason which permits an inference

from one case to another, however similar the conditions may be; and I completely agree with him in this respect.” It should be noted that, although Wittgenstein says (TLP 5.1361) “We *cannot* infer the events of the future from those of the present” and (TLP 6.36311) “It is an hypothesis that the sun will rise tomorrow: and this means that we do not know whether it will rise,” he *also* says (TLP 5.135): “There is no possible way of making an inference from the existence of one situation to the existence of another, entirely different situation.” Wittgenstein *does* follow this with TLP 5.136, “There is no causal nexus to justify such an inference,” but the point of TLP 5.135 has also to do, e.g., with simultaneous ‘situations’ or “states of affairs,” as is evidenced by Wittgenstein’s ‘thorny’ discussion of the ‘independence’ of states of affairs in the *Tractatus* (2.061 & 2.062). It is, I think, not a small question how close or how far this is from Hume’s ‘clear’ articulation quoted by Popper.

<sup>22</sup> *LSD*, p. 28. See also pp. 30, 263–265.

<sup>23</sup> See TLP 4.25: “If an elementary proposition is true, the state of affairs exists; if an elementary proposition is false, the state of affairs does not exist.” Cf. TLP 4.062. For Popper’s adherence to the Correspondence Theory, see *LSD*, pp. 275 and 278, “The Aim of Science,” p. 291, and “Philosophical Comments on Tarski’s Theory of Truth,” pp. 319ff.

<sup>24</sup> *PR* §230.

<sup>25</sup> This is unquestionably Popper’s position. At (*PR* §228), Wittgenstein makes clear that it is also his own, especially when he says “that doesn’t mean that there is a verification of [the hypothesis] which we may approach ever more nearly, without ever reaching it” (i.e., that we can make its *truth* more *probable*, without ever actually being able to *verify* its truth *absolutely*).

<sup>26</sup> *PR* §233; no later than April 1930. Wittgenstein clearly does not mean ‘verified’ or “probabilistically confirmed” when he says ‘confirmed’ here, as is evidenced by, esp., (*PR* §228), below.

<sup>27</sup> Popper, *LSD*, pp. 88, and 102–103.

<sup>28</sup> *PR* §229.

<sup>29</sup> Popper, *LSD*, p. 53 and Section #82: “The Positive Theory of Corroboration: How a Hypothesis may ‘Prove its Mettle’”

<sup>30</sup> *Ibid.*, pp. 86–87.

<sup>31</sup> *Ibid.*, pp. 76–77; esp. p. 76, Ft. #2.

<sup>32</sup> *Ibid.*, p. 278. See also p. 252.

<sup>33</sup> *PR* §228.

<sup>34</sup> Popper says that “what shows itself, if anything, is that this clearly *can* be said: it *has* been said by Wittgenstein, for example,” but this “does not mean that it is meaningless.” *LSD*, p. 437, Ft. #21.

<sup>35</sup> *PR* §226.

<sup>36</sup> *PR* §228. Much later, Wittgenstein *appears* to change his mind, saying (PI §481) that “[i]f anyone said that information about the past could not convince him that something would happen in the future, I should not understand him,” but this is only appearance, for Wittgenstein stresses that these are *psychological* ‘grounds,’ “not propositions which logically imply what is believed.” It is *not* that “less is needed for belief than for knowledge,” since “the question here is not one of an approximation to logical inference.”

<sup>37</sup> *PR* §228.

<sup>38</sup> Interestingly, like Wittgenstein, Quine (1986, p. 398) rejects natural necessity, saying unequivocally that he “reject[s]... the notion of physical or natural necessity, and thus also the distinction between law and accidental generalization.” Given that Popper maintains the distinction between law and accidental generalization by *accepting* physical necessity

(see Endnote #41), this provides a sharp demarcation between Quine (and Wittgenstein) and Popper.

<sup>39</sup> Karl Popper, *Realism and the Aim of Science* (Totowa, New Jersey: Rowman and Littlefield, 1983), p. 74.

<sup>40</sup> *Ibid.*, p. 74.

<sup>41</sup> *LSD*, p. 428. See also pp. 428, 430, and 433. Popper stresses (p. 432) that this was his view in 1934 and that it always has been his view. Popper muddies matters by also saying (*LSD*, Appendix \*x: "Universals, Dispositions, and Natural or Physical Necessity," p. 438; quoted in Endnote #19, above) that "I largely agree with the spirit of Wittgenstein's paraphrase of Hume: 'A necessity for one thing to happen because another has happened does not exist. There is only logical necessity'." Fortunately, a resolution to this confusion can be found in the very same Appendix. Popper agrees with *only* "the spirit" of Wittgenstein's statement, for Popper wishes to stress that the physically necessary natural laws of our world are 'accidental' or 'contingent' in contrast to "logical tautologies" (*LSD*, pp. 429 & 430), and yet *necessary* in contrast with "accidental 'universality'" in nature (*LSD*, p. 438).

<sup>42</sup> Popper, *Realism and the Aim of Science*, p. 74. In *LSD* (p. 437), Popper similarly claims that we only need to *hope* that natural laws exist to make the (methodological) search for them 'rational.' One may well doubt, however, whether Popper's methodology does not assume the existence of laws of nature. In *LSD*, Popper considers "the principle of causality" (e.g., every event is causally necessitated), rather than the much weaker "There are laws of nature," and says (p. 61): "I shall, however, propose a methodological rule which corresponds so closely to the 'principle of causality' that the latter might be regarded as its metaphysical version. It is the simple rule that we are not to abandon the search for universal laws and for a coherent theoretical system, nor ever give up our attempts to explain causally any kind of event we can describe." Cf. *Realism and the Aim of Science*, p. 123.

<sup>43</sup> *LSD*, p. 63.

<sup>44</sup> In 1929, Wittgenstein began working out a finitistic philosophy of mathematics, which he elaborated until 1944, and held for the rest of his life. See my [2002a], [2002b], [2000], [1999a], [1999b], and [1997]. The connections between Wittgenstein's finitistic philosophy of mathematics and his finitistic philosophy of science prompted me to initiate the present investigation.

<sup>45</sup> *PR*, p. 311.

<sup>46</sup> *PR*, p. 310.

<sup>47</sup> *LSD*, p. 63.

<sup>48</sup> See *LSD*, p. 36, Ft. \*4 (1959) for Popper's remarks on Wittgenstein's instrumentalist dissolution of the problem of induction.

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