The Putnam-Goodman-Kripke Paradox

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ABSTRACT. The extensions of Goodman's 'grue' predicate and Kripke's 'quus' are built from the extensions of more familiar terms via a reinterpretation that permutes assignments of reference. Since this manoeuvre is at the heart of Putnam's model-theoretic and permutation arguments against metaphysical realism ('Putnam's Paradox'), both Goodman's New Riddle of Induction and the paradox about meaning that Kripke attributes to Wittgenstein are instances of Putnam's: evidence cannot selectively confirm the green-hypothesis and disconfirm the grue-hypothesis, because the theory of which the green-hypothesis is a part has an unintended model in which the grue-hypothesis is equally true; and there are no meaning-facts that determine reference, because the objects referred to by the referring terms of any language or set of intentional mental states are permutable in a way that is consistent with the truth-values of all other sentences in that language or beliefs in that set. The upshot is that the three paradoxes need to be solved in a unified way.

Keywords: grue, quus, permutation argument, reference, meaning, indeterminacy

1. Introduction

In his foreword to the fourth edition of Goodman's *Fact, Fiction and Forecast* (Goodman ([1954] 1983)), Hilary Putnam points to a resemblance between Goodman's so-called 'New Riddle of Induction' and Wittgenstein's rule-following considerations (Wittgenstein ([1953] 2009), §§138-242).[1] The resemblance obtains on a particular interpretation of the latter by Kripke (1982), according to which Wittgenstein is the father of a new form of philosophical scepticism founded on a paradox about rule-following and meaning. Wittgenstein's alleged scepticism 'should be obvious to any reader of Goodman,' says Kripke, because 'the basic strategy of Goodman's treatment of the 'new riddle' is strikingly close to Wittgenstein's sceptical arguments' (op. cit., 58, 20). In fact, Kripke 'suspect[s] that serious consideration of Goodman's problem, as he formulates it, may prove impossible without consideration of Wittgenstein's' (op. cit. 59).

This suspicion is one starting point of the present paper. Another is Mary Kate McGowan's claim that the New Riddle of Induction, or 'Goodman's Paradox,' is an instance of a 'much more general phenomenon,' namely the fact that syntactic constraints on description are insufficient to prevent empirical knowledge from being trivially true (McGowan (2002), 33). She holds that this phenomenon is also evidenced by Putnam's model-theoretic argument against metaphysical realism (Putnam (1980)), and comments that the latter 'boils down to the very same issue' as Goodman's (ibid.). While McGowan merely takes Putnam to be saying the same thing as Goodman, I will argue here that the inductive problem posed by Goodman's Paradox is an instance of the referential indeterminacy at the core of Putnam's argument, and that the similarity of Goodman's Paradox to Kripke's sceptical take on Wittgenstein (the so-called 'Kripke-Wittgenstein Paradox') is to be explained by the fact that so is the latter.

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[1] Putnam credits Catherine Elgin with having suggested the resemblance to him (Goodman ([1954] 1983), viii); earlier remarks on the affinity between Goodman and Wittgenstein can be found in Blackburn (1969) and Hacking (1975), 69.

How so? Putnam's model-theoretic argument (in conjunction with his 'permutation argument' often collectively referred to as 'Putnam's Paradox')[2] purports to establish that nothing fixes reference, because given any domain of objects and any language to speak about them, the extensions of the terms of that language can consistently be permuted without changing the truth-value of any of its sentences at each possible world. It follows, according to Putnam, that not even an ideal and maximally powerful scientific theory could rule out infinitely many unintended interpretations of any of our terms. Since this, if true, would also be the case of actual scientific theories and their terms, in particular of the colour predicates we use in our evidence statements and inductive generalisations over them, I argue that Goodman's famous 'grue'-problem is best viewed as an instance of the referential indeterminacy highlighted by Putnam.

Idem in the case of the Kripke-Wittgenstein Paradox. Kripke (1982) interprets Wittgenstein as saying that nothing (in particular, no facts) fixes meaning, for example the meaning of the word 'plus,' because there are no conceivable constraints on or rules governing word use that could exclude an infinity of alternative meanings. For the referents of any expression of the language in which we would frame those constraints, for example when teaching a speaker the meaning of 'plus,' can be permuted in an alternative interpretation of that language without affecting anything about what we observe, experience, do, or say in relation to 'plus.' Having the same type of permutation argument at their core, both the Kripke-Wittgenstein and Goodman's Paradox therefore follow from Putnam's, in the sense of being instances of it. I conclude that philosophers of language and science, metaphysicians, and epistemologists, need to treat the three paradoxes as one.

[2] See Putnam ([1978] 2010a) and Putnam (1981), respectively.

2. The Kripke-Wittgenstein Paradox

For expository purposes, I reverse chronological order and start with the Kripke-Wittgenstein paradox.[3] Stripped down to its essentials, it may be summed up as follows: take a mathematical function called 'quus,' denoted by '⊕,' such that

for all $x,y < 57$, $x \oplus y = x + y$

and

for all $x,y \geq 57$, $x \oplus y = 5$ (Kripke (1982), 9),

and assume that you have never previously added the numbers 68 and 57. If you were asked to compute the problem '68+57=?' now, and uttered '125' in response, you would do so without justification, says Kripke. For there is no fact of the matter about your meaning one thing rather than another thing by '+' (ibid.), in particular, no fact of the matter a discovery of which is apt to falsify a meaning sceptic's provocative claim that by the symbol '+' you have always meant quus; and that you should therefore now respond with '5' if you want to stay true to your past (meaning) intentions. If the sceptic's claim cannot be refuted, 'the entire idea of meaning vanishes into the air' (Kripke (1982), 21).

Kripke argues in support of meaning scepticism by elimination, considering one after another different candidate categories of fact that might constitute meaning, and justify the answer 125.' In particular, he discusses facts concerning

(a) my (past and present) use of the symbol '+'
(b) my rules (instructions, algorithms) regarding the correct application of the symbol '+'

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[3] Kripke himself calls it 'Wittgenstein's sceptical problem.' As customary in most discussions of Kripke (1982), I bracket the interesting, but for present purposes irrelevant, question how much Wittgenstein there is in Kripke's Wittgenstein. For important early criticisms of Kripke's exegesis, see e.g. Baker and Hacker (1984), Blackburn (1984), McDowell (1984), Shanker (1987), Savigny (1988), Cavell (1990).

(c) my disposition(s) with regard to the symbol '+'
(d) my (or someone else's) simplest hypothesis concerning the meaning of the symbol '+'
(e) my "qualitative mental history" associated with the symbol '+' (Kripke (1982), 13-51)

and rejects all of them for one or both of the following reasons. Firstly, meaning is normative: if I mean 'plus' by '+,' then this state of affairs creates truths about how I ought to apply the expression, not just truths about how I do or will apply it. Secondly, meaning has what Boghossian calls an 'infinitary' character: if I mean 'plus' by '+,' then this generates an infinite number of truths about how I ought to apply the term (Boghossian (1989), 509). No extant account of the way meaning is constituted that appeals to either one of (a)-(e) can explain both of these attributes, or so Kripke argues.

Numerous objections have been made to the Kripke-Wittgenstein Paradox over the years, punctuated by occasional attempts at a defence.[4] But I shall not engage with this dialectic here, nor will I focus on Kripke's own "Wittgensteinian" approach to the quus problem, his so-called 'communitarian' solution (Kripke (1982), ch. 3). Central to the argument of this paper is, rather, the fact that the Kripke-Wittgenstein paradox treats meaning something by a word as a kind of *projection* that fastens a singular instance of word use by a speaker onto an infinite object, the set of truths about how she ought to apply the term. Meaning thus appears to lay down (normative) 'rails to infinity' (Wittgenstein ([1953] 2009), §§218-219, Wright (2001)), and the relevant sceptical worry is that little about ourselves, the world, or the way we use things that have meaning, appears to justify this assumption. In fact, in light of this infinitary conception of meaning, the Kripke-Wittgenstein Paradox and Goodman-style inductive scepticism resemble two aspects of the same philosophical worry (Wright (1980), 25ff). To substantiate this thought, I turn to Goodman.

[4] See e.g. McGinn (1984), Fodor (1990), chs. 3 and 4, Horwich (1998), chs. 4 and 10, Tennant (1997), ch. 4, Soames (1997), (1998); among the defenders are Allen (1989), Wilson (1998), Kusch (2006), Wright (2012). For a collection/overview and a recent discussion, see Miller and Wright (2002) and Hale (2017), respectively.

3. Goodman's Paradox

Worries about the factuality of meaning initially bear only a minor likeness to the problem of induction. Induction is a non-demonstrative reasoning in support of a general proposition, the support in question being generated by the consideration of particular cases that "fall under" the generalisation. Hume famously noted that when inferring inductively, we assume that 'nature continues uniformly the same' (Hume ([1777] 1975), Bk I, 3, Sect. 6), and the problem that exercised him most was the apparent lack of a rational justification for this assumption. A characteristic feature of Goodman's work on induction is a shift of focus from the principle of uniformity to the analysis of the concept of resemblance between past and future occurrences: we may rest assured that the future will resemble the past, says Goodman, but he adds that he is 'not sure in just what way it will be like the past' (Goodman (1972), 441).

Predictions generated through inductive inference are informed by the way the relevant evidence has been described, in particular by the type of predicate(s) used. Goodman (1946), ([1954] 1983) showed that by manipulating a given predicate's extension it is possible to formulate, using the same inductive rule, two mutually inconsistent hypotheses that appear to be equally well confirmed by the same set of evidence statements. For example in this by now familiar way:

> Suppose that all emeralds examined before a certain time *t* are green. [Now let me introduce] the predicate "grue" and it applies to all things examined before *t* just in case they are green but to other things just in case they are blue. (Goodman ([1954] 1983), 72-73)

At *t* we will have, for every evidence statement asserting that a given emerald is green, another statement asserting that it is grue; and there seems to be no denying that 'emerald *a* is grue' confirms (at least in the minimal sense of 'falling under' or 'being an instance of') 'all emeralds are grue' as well as 'emerald *a* is green' confirms 'all emeralds are green' (ibid.). Yet both generalisations cannot be true simultaneously (Goodman ([1954] 1983), 74).

'Goodman's Paradox' appears to show that by choosing the right sort of predicate 'we shall have equal confirmation […] for any prediction whatever' (Goodman ([1954] 1983), 74), in other words, that 'anything confirms anything' (op. cit., 75). The immediate lesson Goodman drew from this was that 'increase of credibility, projection, "confirmation" in any intuitive sense, does not occur in the case of every predicate' (Goodman (1946), 383), and a substantial part of the subsequent literature on his Paradox predictably focused on identifying *epistemic* criteria, such as e.g. observability, that might appropriately distinguish the green-hypothesis from the grue-hypothesis. The 'grue' problem is not primarily epistemic, however. Goodman thought of induction quite generally as 'the projection […] of characteristics of one realm of objects into another' (Goodman (1946), 383), and he emphasised from the start that even predicate pairs whose extensions do not refer to a class of examined vs. unexamined objects plus a temporal ordering are capable of generating a paradox (e.g. 'green, or under the Eiffel Tower and blue')—as do predicates that do not refer to any ordering at all, be it temporal, spatial, numerical, or otherwise (Goodman (1946), 383-384).[5] Thus, a simpler but perfectly acceptable variant of Goodman's 1954 definition of 'grue' is

'grue' $=_{df}$ *green* before time t_0, or *blue* otherwise.

This is the version of 'grue' I will be using.[6]

Carnap, whose theory of confirmation Goodman was criticising, thought that the 'grue'-predicate refers to a 'mixed' property composed of two 'qualitative' properties and a 'positional' one; and that it is therefore inadmissible in inductive inference, because any system of inductive logic requires the properties and relations designated by its primitive predicates to be *simple* (Carnap (1947), 138ff, 134-136). To Goodman, however, any idea of

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[5] Cf. Kripke (1982), 19; Stroud (2000), 129.

[6] See Barker and Achinstein (1960), 511. Israel (2004) is adamant that defining 'grue' in this way amounts to a serious misunderstanding of the New Riddle. But Goodman himself used Barker and Achinstein's 'grue' (see e.g. Goodman (1960)), and there are reasons for thinking that it better captures the essence of the Paradox (Kowalenko (2011)). Kripke (1982) uses this definition, in any event, and so does Putnam, see Goodman (1954, 1983), xi.

a ‘simple property’ involves a problematic notion of unanalysability, since whether a property is composite depends on ‘a sphere of reference and a method of analysis’ (Goodman (1947), 149); cf. Wittgenstein ([1953] 2009), §47). Goodman later elegantly and effectively underscored this observation as follows:

> True enough, if we start with “blue” and “green”, then “grue” and “bleen” will be explained in terms of “blue” and “green” and a temporal term. But equally truly, if we start with “grue” and “bleen”, then “blue” and “green” will be explained in terms of “grue” and “bleen” and a temporal term. (Goodman ([1954] 1983), 80).

As long as there is freedom in the choice of primitives, ‘simplicity’ is relative to a language (or a language-game, as Wittgenstein would have said).

We can easily make the same point in terms of the Kripke-Wittgenstein Paradox. Let us modify Kripke’s quus and define a new function, ‘quinus,’ denoted by ’$\oplus$‘ and ‘$\ominus$,’ respectively, as follows:

$$
\begin{array}{lrll}
\text{quus:} & x \oplus y = x + y & \text{for all } x,y < 57 \\
 & = x - y & \text{for all } x,y \geq 57 \\
\text{quinus:} & x \ominus y = x - y & \text{for all } x,y < 57 \\
 & = x + y & \text{for all } x,y \geq 57
\end{array}
$$

Then, our familiar ‘plus’ and ‘minus,’ denoted by ‘+’ and ‘–,’ respectively, will appear complex from the point of view of a language in which quus and quinus are primitives:

$$
\begin{array}{lrll}
\text{plus:} & x + y = x \oplus y & \text{for all } x,y < 57 \\
 & = x \ominus y & \text{for all } x,y \geq 57 \\
\text{minus:} & x - y = x \ominus y & \text{for all } x,y < 57 \\
 & = x \oplus y & \text{for all } x,y \geq 57
\end{array}
$$

True, humans cannot do calculations with quus and quinus as basic arithmetic functions, at least not without much labour and awkwardness; and if ‘quus’ were defined as deviating from plus for numbers so large that they are ‘referentially inaccessible’ (van Inwagen (1992), 144), then such calculations would be (humanly) impossible.

Yet, the extensions of the terms ‘quus’ and ‘quinus’ are constructed from the extensions of more familiar terms in a way strictly analogous to those of ‘grue’ and ‘bleen,’ namely via ‘a permutation-based reinterpretation to ‘kink’ the assignments of reference,’ as Hale and Wright describe this manoeuvre.[7] The hypothesis (hinted at by Kripke in (1982), 98n) suggests itself that the difficulty we experience when we attempt to use quus rather than plus in arithmetic springs from exactly the same source as the difficulty we experience when we try to inductively project ‘grue’ rather than ‘green.’ I illustrate this idea with a curve-fitting analogy.

4. Curves, Permutations, and Worlds

The act of choosing one predicate rather than another in a description of an event, pattern of events, or property instantiations, resembles in important respects the plotting of a line over a finite sample of points. Goodman’s Paradox as a curve-fitting problem presents itself as follows: our past and present visual observations of emeralds, finite in number, suggest that the latter are ‘green.’ Claiming, on the basis of those observations, that ‘*all* emeralds are green’ amounts to plotting a continuous line over a finite set of data points representing our observations to date (t_0) of the colour of emeralds. The choice between hypothesis (H_1) ‘All emeralds are green,’ and (H_2) ‘All emeralds are grue,’ is equivalent to a choice between two alternative continuations beyond t_0 of the curve plotted (in this instance, a straight line):

[7] In the context of Putnam’s permutation argument (Putnam (1981), ch. 2); see Hale and Wright (2017), 712, and *infra*.

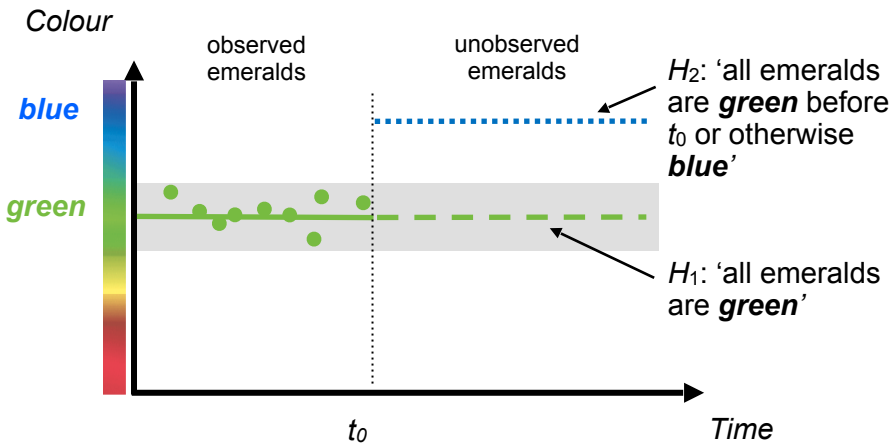

Fig. 1[8]

Goodman's green/blue–grue/bleen permutation shows that the choice of curve, given the evidence, may seem obvious or "natural" if we use 'blue' and and 'green' on our colour-axis, but that it will seem equally "natural" if 'bleen' and 'grue' are our primitives. We cannot determine which hypothesis is simple and which complex (continuous or discontinuous) just by looking at the relevant curves, for how curves will appear to us always depends on the system of representation used:

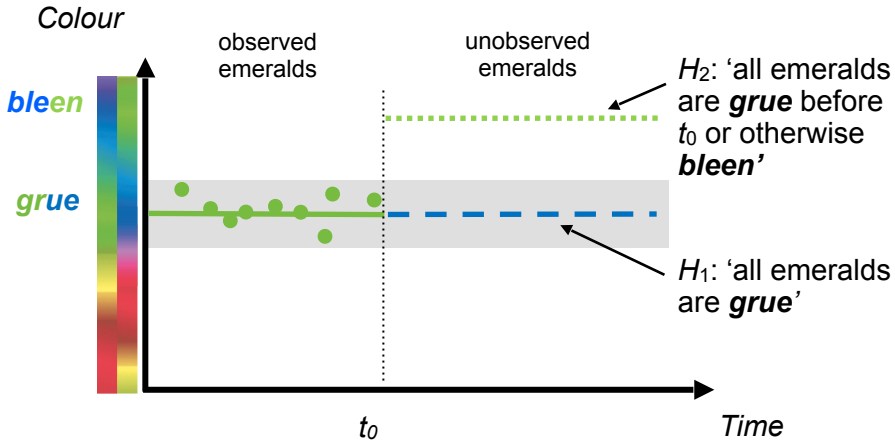

Fig. 2

[8] The grey rectangle in Fig. 1 represents the chromatic variation conventionally allowed by the ordinary language predicate 'green.' There is no sharp demarcation between clear-cut instances of 'green,' "borderline" cases, and clear-cut instances of '¬green,' but it suffices for present purposes that there are instances where application of the predicate is uncontroversial. Goodman himself discusses grue-like hypotheses in the context of curve-fitting and simplicity in Goodman (1972), 344-345.

Using a suitable coordinate scale we can represent any arbitrarily complex curve as a straight line, and any straight line as an arbitrarily complex curve.[9]

The analogy illustrates that a cognitive agent who makes inductive use of the 'grue' predicate would do so in the same way we use 'green,' at least insofar as her data analysis and curve-fitting procedures are concerned: with a preference for simplicity, i.e. straight and continuous lines, while maintaining closeness to the data by minimising squared residuals, etc. She projects 'grue' in a rational manner, as her notion of the colour grue is as simple for her as our notion of green is for us. In fact, we would expect her to be able to ostensively define 'grue,' for the primitive colour predicates of any natural language ought to be *observational* for the speaker of that language (Goodman (1960), 523). Thus, a competent grue-speaker ought to be able to teach a learner the meaning of 'grue' by pointing at a grue object, and we would expect the latter to be able to pick up the predicate's meaning without reference to another colour or any other property.

Not coincidentally, Kripke discusses a grue version of his own Paradox in precisely the context of ostensive definition:

> Perhaps by 'green' in the past I meant *grue*, and the color image, which indeed was grue, was meant to direct me to apply the word 'green' to *grue* objects always. If the *blue* object before me now is grue, then it falls in the extension of 'green,' as I meant it in the past (Kripke (1982), 20).

Kripke is emphatic that no sceptic-proof "litmus test" for distinguishing 'green' and 'grue' can be devised on the basis of a feature identifiable by *ostension* that green possesses, but grue does not. In particular:

> It is no help to suppose that in the past I stipulated that 'green' was to apply to all and only those things 'of the same colour' as the sample. The sceptic can reinterpret 'same color' as same schmolor, where things have the same schmolor if … (ibid.)

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[9] Note that Fig. 2. represents the grue colour-spectrum using what appear to be two separate spectra. The grue/bleen colour coordinate scale as a result seems strangely "gerrymandered," but this is an artefact of any attempt to graphically represent grue using our own colours. For 'grue' and 'bleen' are not actually colours, but *schmolours* (Ullian (1961), 387); also Goodman (1960); see *infra* on the concept of 'schmolour.'

… they have colour A before t_0, or colour B thereafter. Neither can we drive a wedge between 'green' and 'grue' by pointing out that things of the same colour, but not of the same schmolour, are visually indistinguishable. As Shoemaker (1975), 188 noted, we can think of grue-speakers as finding things of the same schmolour *ingrustinguishable*, where two things are 'ingrustinguishable' if they are indistinguishable before t_0, or distinguishable thereafter ... and so on.

On pain of incoherence this permutation game needs to be played to the very end, of course, i.e. until the putative grue-speaker's entire language along with its concomitant conceptual scheme have been "grue-ified" (permuted). A key question is whether this is possible. Shoemaker (1975) argues that even if it *were* possible,[10] it would have the consequence that after t_0 a green- and a grue-speaker would not be able to *agree* whose induction had been falsified by reality (op. cit., 189ff). And, according to Shoemaker, if a grue-speaker's visual experience of emeralds after t_0 is such that it gives her no reason to stop calling emeralds 'grue,' then we must assume that her grue-concept is different from the one that generates Goodman's paradox. The paradox, after all, *qua* paradox requires the relevant hypotheses to be incompatible. So there is an 'agreement-after-t_0'-condition that a grue-speaker with a fully permuted language and conceptual scheme would fail to satisfy (Shoemaker (1975), 185ff; see also Hesse (1969), Hacking (1998), and others).

As in the case of the Kripke-Wittgenstein Paradox my brief here is not to engage at length with arguments against or in support of Goodman's

[10] He cites Hesse (1969) who suggested that at least as far as the language of science is concerned, it is not; if Putnam's arguments against metaphysical realism are sound, that is incorrect (see *infra*).

Paradox,[11] only to show its relationship to Kripke-Wittgenstein. To that end it is useful to note the nature of the language relativity that Goodman took himself to have discovered, developed more explicitly in his later work, especially Goodman (1976), (1978). The Goodman of *Ways of Worldmaking*, for example, is entirely comfortable with the notion that green- and grue-speakers live in different worlds (or that they have constructed different *versions* of the world)[12] that are each equally compatible with past, present, and future evidence. It would be incorrect to attribute to Goodman the somewhat naïve view that a simple test such as waiting until t_0 arrives, and checking the colour of emeralds then, could be sufficient to *extract* a grue-speaker from her version of the world and bring her "home" to ours, the world of green. This is not what a 'world' in Goodman's sense is about, for a crucial element of the latter are inductive practices and other methods of forming expectations that will always qualify, from the point of view of that world's language and conceptual scheme, as rational, reliable, and confirmed by the facts.

This, *contra* Shoemaker, does not mean that Goodman's Paradox is not a paradox. 'All emeralds are green' and 'All emeralds are grue' still conflict, for quite independently of how things *appear* to either green- or grue-speakers, it

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[11] For a useful if somewhat dated overview of the debate, see Stalker (1994); for more recent discussion, see e.g. McGowan (2003), Okasha (2007), Israel (2004), Fitelson (2008), Kowalenko (2011), Freitag (2016), Skiles (2016). It is worthwhile to point out here, however, that just as many other proposed solutions of Goodman's Paradox, Shoemaker's argument—the 'incoherence dissolution,' as Stalker (1994), 2 calls it—is premised on *de-emphasising* the symmetry between green- and grue-like sets of predicates, languages, and conceptual schemes that Goodman insisted upon. To the nominalist Goodman, nothing about the predicate 'green' is special, except that it is ours. If he is correct about that, then any philosophical argument expressed in a language L_1 (our green-language) that purports to establish, on grounds of incoherence, that a rival set of grue-like predicates cannot be admitted into L_1 or its inductive practices, could be expected to work equally well from within language L_2 (the grue-language). There, this sort of argument would establish equally firmly that the predicates of L_1 cannot, on grounds of incoherence, be admitted into L_2 or its inductive practices, and so on. In other words, the incoherence dissolution argument is language-relative in itself, which suggests that Shoemaker's agreement-after-t_0 condition need *not* be satisfied: green- and grue-speakers after t_0 will think, quite reasonably, that their respective inductions came out right. What they think, say, or take themselves to observe, is irrelevant however, insofar as what matters is that green- and grue-speakers cannot both be right simultaneously; see Putnam (1981), 36, and *infra*.

[12] Goodman (1978), 3ff; cf. Putnam ([1978] 2010a), 137, also Hacking (1993), 271.

is still the case that after t_0 emeralds cannot be both green and "grue," in other words blue, simultaneously (as we green-speakers would put it). And they cannot be both grue and "green," in other words bleen, simultaneously (as grue-speakers would put it). Purely epistemic approaches to Goodman's Paradox risk overlooking that in the colour-space mapped out by the green-language, an emerald's being green non-deductively implies that the emerald is not blue; and that in the colour-space mapped out by the grue-language, an emerald's being grue implies that it is not bleen. (This is an instance of Wittgenstein's so-called 'colour-exclusion problem' (Wittgenstein (1929), 167ff, (1975), 105-114). The two 'versions of the world' associated with the green- and the grue-language, respectively, therefore cannot be true simultaneously, in the sense of both coming out as a true description of the world when expressed in the terms and concepts of either *one* language. But, crucially, no meta-language is available that combines the linguistic and conceptual resources of the green and grue-languages and consistently represents both versions of the world, that another version of Goodman's Paradox would not equally apply to; the same goes for any meta-meta-language, and so on, cf. Putnam ([1978] 2010a), 132-135.

The curve-fitting analogy thus illustrates why Goodman insisted that 'if we deny that grue is a single color we are in effect merely saying that grue is positional, and so begging the question' (Goodman (1960), 523). For the question his Paradox asks was never how to justify our preference for simple lines or "straight" inductive inferences over complex lines or "bent" inferences. That was Hume's problem. Goodman's Paradox shows that just as any straight line can be made to look bent by permuting the co-ordinate scales, any "straight" predicate can made to look "bent" by permuting the language. Since this can only consistently be done if assignments of reference are kinked, in just the right way, for *all* terms of the relevant language, the crux of the matter is the question whether a full "gruefication" of a natural language is (rationally) possible. Goodman assumes that it is, and asks which of the admissible (because extensionally adequate) permutation schemes is the "correct" one, if any? To reject 'grue' and its scheme on grounds of simplicity would be to beg the question, yet no rational justification of 'green' and its reference scheme appears to be forthcoming—at least none based on observations, evidence statements, or facts of the matter. Putnam's Paradox, I

will argue in the next Section, supplies the required argument that a full "grue-ification" of a natural language—any natural language—is rationally possible; in fact, infinitely many are.

5. Putnam's Paradox

Beliefs, it is often said, have a mind-to-world 'direction of fit.' If there is to be a determinate word-to-world and concept-to-world relation, then it seems that so have words and concepts. But what determines *correctness* of fit? Any object can be multiply re-described, since it will always satisfy infinitely many descriptions containing non-synonymous, yet partially co-extensional expressions. Are all of these 'equivalent' descriptions equally acceptable (Putnam ([1978] 2010b), 131)? Goodman would object to talk of equivalent re-description as description via non-synonymous terms: to him, who does not believe in the philosophical usefulness of the notion of 'meaning' (see e.g. Goodman (1949), (1953)), re-description just *is* the extensionally correct application of an alternative predicate to an object. But independently of one's position on this, it seems hard to deny that the way in which we, somehow, assign words to objects in the world is not *uniquely* determined by the properties of those objects, our mental states about them, or our behaviour. As a result, there appears to be no unique description that is either 'inductively best,' or 'most appropriate given our (meaning) intentions.' There are just too many ways in which words or mental symbols can be mapped onto the world.

Putnam fleshed this thought out as follows: two speakers may have different *models* of English—i.e. interpretations of the language that assign sets of objects to its referring terms in a way that maintains the truth values of all of its sentences—each of which are 'equally admissible.' He proved a general result in logic that for any interpretation of a first-order language, L, we can construct another ('unintended') interpretation which makes the same sentences of L true at every possible world whilst varying the extensions of its sub-sentential terms and predicates (the 'permutation argument,' see Putnam

(1981), Appendix).[13] The permutation argument suggests the conclusion that, given any domain of objects and any first-order language to speak about them, the extensions of the terms in the sentences of that language can consistently be switched without changing the truth-value of the sentences at each possible world (Hale and Wright (2017), 706).[14] Thus,

> [h]ow we imagine [objects], what experiences we have when we see and touch [them], what we do in their presence, etc., are all unaffected by the lack of a unique assignment of objects and sets of objects to our words; the words [...] simply change *their* reference from model to model in such a way that nothing we can notice is ever affected. (Putnam (1983b), xii).

The permutation argument is closely related to Putnam's slightly earlier model-theoretic argument against metaphysical realism (Putnam (1980)).[15] Here, Putnam used the Löwenheim-Skolem theorem[16] to argue that if no first-

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[13] For a simple illustration of permutation, take the theory (*T*) consisting of the three sentences 'Joe is taller than Peter,' 'Peter is taller than Carol,' and 'Joe is taller than Carol' (McGowan (2002), 29; also Williams (2007), 369). Whether (*T*) is true depends on whether there are objects in the world that simultaneously satisfy all the sentences of (*T*); and that depends on how we interpret the referring terms in these sentences, in particular, on whether 'Joe,' 'Peter,' and 'Carol' refer to objects that do in actual fact stand in the relation of 'is taller than' to each other in the way (*T*) alleges. (In which case (*T*) has a model and Joe, Peter, Carol, and the taller-than relation are the domain of the model.) It is clear that (*T*) has more than just one model. For if 'Joe,' 'Peter,' 'Carol' and 'is taller than' were defined as referring to the mountains Sagarmāthā, Kilimanjaro, Mont Blanc, and the higher-than relation, respectively, then these objects would also constitute a model, albeit unintended, for (*T*); as would the natural numbers 3, 2, 1, and the greater-than relation (>), and so on. It is intuitive to think that if there are enough distinct objects and relations in the world, then (*T*) will have quite a large number of unintended models, and that the more things there are, the more there will be models of (*T*); and further, that if the actual world consisted of infinitely many objects and infinitely many relations between these objects—as metaphysical realists typically believe—that (*T*) would have infinitely many models; and, finally, that in such a world, every theory would have a model. The same would be true of languages, if we think of languages as sets of sentences.

[14] Hale and Wright have extended Putnam's method of proof to show the same for second-order and modal languages (op. cit., 723-725).

[15] Also Putnam (1981), 33-36, Putnam (1983a), Putnam ([1978] 2010a).

[16] The fact in logic that if a first-order theory has a model, then it has a countably infinite model (the 'Downward' Löwenheim-Skolem); and that if a such a theory has a model of any infinite cardinality, then it has models of every infinite cardinality (the 'Upward' Löwenheim Skolem), see Skolem ([1920] 1967).

order theory is able to control the cardinality of its infinite models, as Löwenheim-Skolem shows, then no first-order theory with an infinite model will have a *unique* model. It follows, according to Putnam, that not even a first-order formalisation of 'total science' could rule out infinitely many unintended interpretations of not just the notion of a 'set,' as Skolem himself had suggested, but of *any* term whatsoever (Putnam (1980), 2-4, 16). ('Total science' being an ideal scientific theory that satisfies any desired 'theoretical or operational constraint'). Catherine Elgin comments:

> The model-theoretic argument works because sets are plentiful and undiscriminating. Any collection of objects, however motley its membership, constitutes a set. So set theory has the resources to supply truth makers for every consistent theory—not only ideal scientific theories, but also a host of other theories we have not the slightest inclination to countenance. Elgin (1995), 289

The upshot of this is ontological relativity, Putnam says in a nod to Quine (1968), because the argument turns everyday objects into purely metaphysical constructs: 'what am I to make of the notion of an *X* which is a table *or* a cat *or* a black hole (or the number three *or* ...)? An object which has no properties at all in itself and any property you like 'in a model' is an inconceivable *Ding an sich*' (Putnam (1983b), xiii). Putnam urges us not to accept this consequence and offers his own solution, 'internal realism' (see e.g. Putnam (1983b), 84ff, (1990), 30-43)—an answer that like Goodman's theory of 'inductive entrenchment' or Kripke's 'communitarian' view has proven somewhat less influential than the question that prompted it.

As with Kripke-Wittgenstein's and Goodman's Paradox, I will neither attack nor defend Putnam's argument, nor examine the merits of his own solution, or engage with the literature doing one or the other.[17] I want to show, rather, how Putnam's dramatic conclusion that 'one can 'Skolemize' absolutely everything' (Putnam (1980), 476) connects Putnam's, Goodman's, and Kripke-Wittgenstein's Paradox.

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[17] For early criticisms and more recent contributions, see e.g. Lewis (1984), Devitt (1984), ch. 11, van Fraassen (1997), Douven (1999), Chambers (2000), Bays (2001), Weiss (2004), Taylor (2006), Williams (2007), Button (2011), (2013); for an overview of the state of the debate, see Hale and Wright (2017).

6. Generalised Skolemism

We know from Gödel's completeness theorem that any consistent first-order theory has a model, i.e. a set of objects (its domain) that simultaneously satisfy all of its sentences. The Upward Löwenheim-Skolem theorem adds that if this domain is countably infinite, then the theory will have infinitely many such models. Löwenheim-Skolem thereby shows, as Putnam put it, that theories expressed in a first-order logical language cannot in and of themselves determine their own objects (Putnam (1983b), 1, 15, 23). However, if the theorem is true of all logico-mathematical first-order theories, then, Putnam argued, it can be expected to be true of any *empirical* first-order theory, too, even if the latter is maximally powerful (Putnam (1980), 464). Suppose, for example, that an ideal physical theory specifies all physical magnitudes at all rational space-time points of the universe to arbitrary accuracy (= 'operational constraint'), as well as exhibiting simplicity and coherence to a perfect degree (= 'theoretical constraint'); then, so Putnam's claim, Löwenheim-Skolem proves that we could still find an alternative model with this domain that preserves the truth-values of all sentences of the theory, and meets all other constraints (ibid.). If this is possible for an ideal theory, then, *a fortiori*, it would be for any non-formalised and less powerful theory or language.

The parallel between 'generalized Skolemism,' as Wright (2001), 392 calls this phenomenon, and Goodman's Paradox ought to be evident by now. If nothing fixes reference, not even total science as Putnam defines it, then nothing can exclude a grue-like permutation of the extensions of the terms of a scientific theory that preserves the truth-value of all of its sentences; especially and most importantly, the truth of the theory's evidence statements and inductive generalisations over them. Goodman's grue-problem therefore is an instance of 'Skolemism:' our evidence statements cannot selectively confirm the green-hypothesis and disconfirm the grue-hypothesis, because the theory (T) of which the green-hypothesis is a part (say, mineralogy) has an unintended model that contains the grue-hypothesis. Furthermore, no amount of new evidence, say, in the form of statements describing the colour of emeralds after t_0, could eliminate unintended models, because even if (T)

contained *all true sentences*, it would still have infinitely many of them (Putnam (1980), 477).

What about the Kripke-Wittgenstein Paradox? Another plausible 'operational' constraint on total science, according to Putnam, is that it ought to predict all sense data. Löwenheim-Skolem implies that different models of our language will assign different referents to the terms that name ordinary material objects or colour experiences, such as 'cat,' 'dog,' 'red,' 'green,' etc. Anticipating the Kripke-Wittgenstein Paradox, Putnam writes

> […] if we agree with Wittgenstein that […] fixing one's attention on a sense datum and thinking 'by "red" I mean whatever is like *this*' doesn't really pick out any relation of similarity at all – and make the natural move of supposing that the intended models of my language […] are singled out by operational and theoretical constraints, then, again, it will turn out that my past sense data are mere formal constructs which are interpreted differently in various models. […] It seems to be absolutely impossible to fix a determinate reference (without appeal to non-natural mental powers) for *any* term at all. (Putnam (1980), 475-476, compare Kripke (1982), 20 quoted above)

Appeal to a *non-natural* mental power is an intuitive response to the predicament of having to rule out unintended models of our language, as Putnam notes on several additional occasions (e.g. Putnam (1980), 464, 466) —just as appeal to non-natural and *irreducible* meaning-facts is an intuitive attempt at ruling out the meaning sceptic's interpretation of 'plus' (Kripke (1982), 41). Indeed, many of us will feel that two models of a language or theory with the same domain could not possibly "say the same thing" about that domain—they are two different interpretations, after all—and that the difference in what these models are saying must be what, given the state of the world, makes some of them admissible and others not.

Perhaps the answer lies in assuming that we *grasp* meanings in something like the same direct and irreducible way in which Platonists claim we grasp forms*?* This direct access would single out a unique preferred reference scheme for the predicates in our theory, and the Paradox would be averted. In fact, our very understanding of our own language would, on such a view, reduce to such a grasp (Putnam (1980), 464)—solving, in one fell swoop, Kripke's Paradox along with Putnam's. The Platonist view,

unsurprisingly, requires a bit of metaphysics: we would effectively assume that 'a sign-relation is built into nature' (Putnam (1983b), xii), and that our words are attached to one definite object or set of objects in the world with 'metaphysical glue' (Putnam (1980), 479). Merrill (1980), Lewis (1983), (1984) and Sider (2011) speculate, in a similar vein, that some collections of things or properties are *reference magnets*, i.e. privileged or 'eligible' referents for our scientific terms that represent the natural classes or properties that carve nature at its joints. The world, on this metaphysical realist view, chooses for us which model is the correct one, because it is the natural properties of things that cause our words to refer uniquely and determinately. A crucial question for accounts of this type is whether reference magnetism, i.e. the set of relationships that are postulated to exist between words and things, in itself counts as a natural property. Putnam, in his 'Just More Theory' objection to causal theories as a solution to his Paradox, says 'no.'[18]

Not coincidentally, again, the principal foil for Kripke (1982)'s argument are, precisely, causal theories of meaning. Wittgenstein's rule-following considerations were a multi-pronged attack on a conception of word meaning as uniquely determining reference; i.e. on meaning as outstripping actual use and normatively fixing, like 'rails to infinity,' correct use by singling out an infinite set of truths about correct application. A number of contemporary causal-dispositionalist theories propagate something like this view.[19] If Putnam's Paradox is sound and nothing fixes reference, because there are no (metaphysical) facts of reference, then we would expect this type of account of meaning to be in trouble, too. Causal theories say, after all, that meaning determines reference by way of causal relationships between objects and meaningful states or entities that obtain *in virtue of* their meaning. If there are no reference-facts, then modus tollens would suggest that there are no

[18] See Putnam (1980), 476ff, Putnam (1981), 45-46, Putnam (1983b), 18, (1994a), 358ff. For a critical discussion of the 'Just More Theory' argument, in particular the charge that it begs the question against Metaphysical Realism, see e.g. Devitt (1984), ch. 11, Taylor (1991), Melia (1996), Hale and Wright (2017), 714-716. For a defence, see e.g. Button (2013), ch. 4.2.

[19] See e.g. Miller (1997), Martin and Heil (1998), Horwich (1998), (2005).

meaning-facts either, at least no meaning-facts of the kind that determine reference-facts.[20]

Kripke introduces 'quus' by way of asking if, perhaps, we have 'used 'plus' and '+' to denote quus' in the past Kripke (1982), 8-9, and he defines 'quus' *extensionally* by constructing it from the extensions of the more familiar terms 'plus,' '57,' and '5.' In fact, Kripke frequently employs the expression 'to use 'A' to denote B' as a proxy for 'to mean B by 'A,'' and he says explicitly that 'for most purposes of the present paper […] we always can use 'mean' to mean denote' (Kripke (1982), 10n). Since the meaning of the relevant terms is given by their extensions, and the latter can be permuted, the problem of identifying the grounds on which to disallow the plus/minus–quus/quinus permutation is *identical* to the problem of identifying the grounds on which to disallow the green/blue–grue/bleen one. For if it is insufficient to stipulate, say, that 'green' shall apply to all and only those things 'of the same colour' as a green sample, because a permutation of the meaning of 'same colour' such that the term applies to all and only those things of the same *schmolor* makes 'grue' equally appropriate; then, by analogy, it would also be insufficient to stipulate, say, that 'plus' shall apply to all and only those ordered triples 'of the same form' as $\langle x, y, x + y \rangle$,[21] because a permutation of the meaning of 'same form' such that the term applies to all and only ordered triples of the same *schmorm* would make 'quus' equally appropriate.[22] *Mutatis mutandis* for any other conceivable constraint on or rule governing the use of 'green' or 'plus,' or any other term intended to exclude their interpretation as 'grue' or 'quus' or any other term.

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[20] 'If meaning determines reference then reference is determinate;' 'reference is not determinate' (Putnam's Paradox); therefore, 'meaning does not determine reference.' In fact, on a model-theoretic account of semantic facts this inference is likely to hold quite independently of our preferred theory of meaning, causal or not (see Button (2013), p. 11ff; Sova (2017), 9). In any event, without the sort of understanding of the meaning of our terms that could help us disambiguate between referential permutations, we stumble directly into the Kripke-Wittgenstein Paradox (see *infra*).

[21] Where '$\langle x, y, x + y \rangle$' stands for the infinite set of ordered triples that constitutes the plus-function as defined over positive integers: $\{\langle 1,1,2\rangle, \langle 2,1,3\rangle, \ldots \langle 57,68,125\rangle, \ldots\}$.

[22] Any two ordered triples $\langle x, y, z \rangle$, where $x,y,z \in \mathbb{Z}^+$, can be defined as having the same *schmorm* iff$_{df}$ they have the same form for all $x,y < 57$, and have the form $\langle x, y, 5 \rangle$ for all $x,y \geq 57$.

Everything can be Skolemised, it seems, because it is not just mathematical sets that are plentiful and indiscriminating, as Elgin put it, but also extensions and, crucially, *meanings*. Meanings, qua intentional states, are supposed to be special. Hale and Wright (2017), 709 grant that the generality of the permutation argument is 'absolutely striking,' but note 'how little the kind of 'interpretation' here in play has to do with real interpretation,' the kind that specifies propositional contents (ibid.). I have argued here that the Kripke-Wittgenstein Paradox is a mere instance of Putnam's, and while this in essence relegates the former to an application of the latter to a plus sign, it renders explicit something that was only implicit in Putnam's discussion: meanings, which are presumably the product of *real* interpretation in Hale and Wright's more demanding sense of the word, are susceptible of the same sort of permutation as extensions are. For meanings, too, can be swapped around in such a way that no inconsistency arises with the truth-value of any sentence of our language, or any of our beliefs. After all, if an alternative model of our language can permute the referents of its terms without affecting anything we experience, do, or say in relation to them, then that inevitably includes all of our sensations, observations, phenomena, and other 'appearances' (Button (2013), 46-52)—as well as the 'meaning experiences' associated with those terms.

Wittgenstein was notoriously dismissive of the idea of a *Bedeutungserlebnis* (Wittgenstein ([1953] 2009), ii, §10); and so was Goodman. But even if meaning experiences were real, it is not clear how they could possibly be fine-grained enough to select a unique model that rules out the unintended interpretations in either Kripke-Wittgenstein's, Goodman's, or Putnam's Paradox; and it is not clear either how any other category of meaning-fact, which would in any case be a finite fact, could. Hacking (1993), 287 comments that the Kripke-Wittgenstein Paradox brings an 'inner-directed' scepticism to the table (whereas the scepticism resulting from Goodman's is 'outer-directed'), and notes that any such inner-directed scepticism, if actually experienced as practical live doubt, would be existential in nature—an anguish resulting from how one experiences one's own meanings, and a lack of knowledge not just of what to expect or do, but how to feel (op. cit., pp. 291-292). The Kripke-Wittgenstein Paradox thus underscores in a new way the apparent need for "metaphysical glue"—or as some authors put it, a

superlative fact—to attach our words to the world without any of our knowing or doing, and thereby ground the only kind of 'interpretation' of the terms of our language that would be impervious to permutation.

In the absence of such ontological extravagance, the three paradoxes jointly imply that no discrepancy between reality and our descriptions of it can arise, whether in our inductive inferences, colour ascriptions, or indeed in any other word or thought use. For we cannot say which model of our language or our intentional mental states is the correct one while operating within any particular model; and if all things with meaning need to be interpreted to be understood, then we always operate within one.[23] Either way, we appear caught between a rock and a hard place.[24]

Conclusion

Goodman's writings on confirmation and induction from the 1940-50s were familiar to and influenced Kripke as well as Putnam.[25] And while Putnam's arguments from the 1970s and early 80s slightly preceded but did not, as far as I am aware, notably influence Kripke, Putnam evidently could not have influenced the early Goodman, and neither could have Kripke. It would be a mistake, however, to confuse chronological order or historical influence or its absence for the order of ideas. As would be making much of the fact that Putnam, who wrote his foreword to Goodman *after* he developed his model-theoretic arguments, omitted to connect the latter to Goodman's discussion of

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[23] This is the assumption Putnam explicitly questioned in his internal realist phase, as well as after his "pragmatist turn" (see e.g. Putnam (1994b), (2004), Putnam and Putnam (2017)): we only *need* interpretations to attach words/thoughts to their referents/objects, if they would be unattached without them. A similar intuition is at work in Goodman's and Kripke's use-based solutions to their respective problems (cf. Wittgenstein ([1953] 2009), §198). Whether these moves are successful is beyond the scope of this paper.

[24] Cf. Sova (2017), 13-14 who agrees that permutation is the core idea of Putnam as well as Kripke-Wittgenstein, and that the two Paradoxes pose the same dilemma for realism: either there are no facts about meaning/reference, or meaning-ascriptions have intrinsically *unobservable* and *irreducible* truth-conditions. Sova draws a different conclusion, however, and does not mention Goodman.

[25] See e.g. Putnam (1979), Putnam (1982), 162; Putnam hints at a generalisation of Goodman's New Riddle to *explanation* at Putnam (1982), 151; Goodman's influence on Kripke is self-evident.

induction, or even to remark on their relevance. Putnam may or may not have found noteworthy that his work uses, formalises, and generalises the permutation of reference argument that Goodman deployed to illustrate the apparent admissibility of 'grue,' 'bleen' and other 'disjunctive' predicates in inductive inference;[26] or, indeed, that the Kripke-Wittgenstein Paradox is the same move in the context of the theory of meaning.

Similarly, McGowan is correct to say that Putnam was 'making much the same point' as Goodman,[27] although Putnam may or may not have agreed with her that that point is the worry that without constraints on the extensions eligible for being referents of the terms of our language, all non-contradictory empirical claims end up trivially true (McGowan (2002), 33). McGowan thinks that the main philosophical challenge posed by the connection between Putnam's and Goodman's Paradoxes is the construction of a theory that would ensure 'the rightness of categorization' and she asks if Metaphysical Realism, in particular, can supply us with the right extensions (McGowan (2003)). Putnam however might have seen the crux of the issue instead as the (not unrelated) problem of the irreducibility of intentional properties—among which meaning and reference—to physicalistic ones,[28] or focused on other issues related to 'Internal Realism.'

I note a further challenge. The main contenders today for the resolution of either of the three paradoxes are often naturalist/causal theories, according to which the world chooses for us which model is correct. If it is true that Goodman's and Kripke's Paradoxes are instances of Putnam's, then it follows that any attempt at resolving either problem will fail, if it relies on a solution of one of the others. After all, you cannot refute that 'Socrates has a beard' by assuming it untrue that 'all Greeks have beards;' neither can you refute the latter generalisation by assuming that Socrates does not have one; and it is bad form, too, to try to show that Socrates does not have a beard by assuming that

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[26] See e.g. Goodman ([1954] 1983), 79, Goodman (1966); others in his wake re-deployed the argument, e.g. Barker and Achinstein (1960), Davidson (1966), Schwartz, Scheffler et al. (1970), and many more.

[27] McGowan was the first to explicitly connect Putnam's Paradox with Goodman's New Riddle in this manner, although she did so in the context of Russell's theory of knowledge (McGowan (2002), 26-28, and passim), skipping over Kripke-Wittgenstein.

[28] 'Intentionality won't be reduced and won't go away' (Putnam (1988), 1).

Plato does not. There are examples of something like this happening in the literature. In the case of Kripke's Paradox, for example, Ruth Millikan's causal/dispositionalist account of meaning grants explicitly that by invoking biological 'competences' we *presuppose* the existence of natural properties that would block Goodmanesque worries about grue-like ones (Millikan (1990), 334). Martin and Heil (1998)'s theory, on the other hand, assumes implicitly that nature 'projects' in a straight, in other words non-grue-like, manner from a disposition's manifestations to its underlying dispositional state (op. cit. 517ff). Analogous worries are in order about naturalist theories of properties as purported solutions for Goodman's Paradox, starting with Quine (1969); and causal theories of reference as a solution for Putnam's such as Fodor (1990)'s. Perhaps the metaphysical realist objection to Putnam's 'Just More Theory' argument will require review, as well.

Further elaboration of these suggestions is for another time. Suffice it to conclude, for now, that a satisfactory solution of *any* of the three paradoxes is most likely to require philosophers of language and science, metaphysicians, and epistemologists, to treat them in a unified way.

Disclaimer

The corresponding author states that there is no conflict of interest

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