

# Indeterminate Truth

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## 1. PREAMBLE

Can a truth-bearer be true but not determinately so?<sup>1</sup> On the enduringly popular standard supervaluational conception of indeterminacy, under which the principle of bivalence is invalid, the answer is a straightforward *No*. On such a conception, truth just is determinate truth—truth in all admissible interpretations.<sup>2</sup> For that reason, a more interesting question is: can a truth-bearer be true but not determinately so on a conception of indeterminacy under which both classical semantics and classical logic remain valid?<sup>3</sup> Under such a conception, very roughly, a truth-bearer is indeterminate in truth-value just in case it is either true or false but it is not determinate that this truth-bearer is true and not determinate that it is false. Within such a classical framework, the possibility of indeterminate truth has proved to be at best elusive, at worst incoherent. On this score, Crispin Wright alleges that it

1. Following Williamson (1996, 44), I take “definitely” and “determinately” to be interchangeable, though I will use the latter term throughout.

2. See van Fraassen (1966, 1968), Thomason (1970), Dummett (1975), Fine (1975), Keefe (2000). Given supervaluational semantics, a truth-bearer can be true on one but not all admissible interpretations (and so not determinately true). However, this does not entail that the truth-bearer is true *simpliciter* (but not determinately so).

3. Classical semantics is taken to include bivalence, “bi-exclusion” (the thesis that no truth-bearer is both true and false), the appropriate disquotational schemas for truth and denotation, plus the claim that validity is necessary preservation of truth.

does not seem intelligible that there should be any way for an utterance to be true save by being definitely true—at any rate, there is no species of indefinite truth (Wright 1995, 143; see also Dummett 1975; Wright 1987).

And in a similar vein, Tim Williamson puts the challenge this way:

Definite truth is supposed to be more than mere truth, and definite falsity more than mere falsity. But what more could it take for an utterance to be definitely true than just for it to be true? [...] Such questions are equally pressing with “false” in place of “true.” Again, “TW is thin” is no doubt definitely true if and only if TW is definitely thin, but what is the difference between being thin and being definitely thin? Is it like the difference between being thin and being very thin? Can “definitely” be explained in other terms, or are we supposed to grasp it as primitive? (Williamson 1994, 194–95; see also his 1995).

Williamson suggests that the only way to make sense of the “determinately” operator is to treat it as equivalent to “knowably” (Williamson 1994, 195; 1995). Hence, to say that a truth-bearer is indeterminate in truth-value is just to say that it has an unknowable truth-value: indeterminate truth is just unknowable truth. The trouble with this suggestion is that any model of indeterminacy that validates classical logic and classical semantics must then represent indeterminacy to be an exclusively epistemic phenomenon. But even if we are happy to grant the validity of classical logic and classical semantics across the board, it is questionable to assume from the outset that *all* genuine forms of indeterminacy are epistemic. For example, certain sorts of quantum phenomena exhibit what is best seen as non-epistemic indeterminacy.<sup>4</sup> Somewhat more controversially, the future may be objectively open whereby actuality is composed of a tree of branching histories such that future contingent sentences have indeterminate truth-values.<sup>5</sup> Whether there are any further species of non-epistemic indeterminacy is a controversial matter (see below). However, it ought to be clear that it is far too hasty to assume that the validity of classical logic and classical semantics rules out the possibility of any non-epistemic species of indeterminacy.<sup>6</sup>

With these observations in hand, our question now becomes: can a truth-bearer be true but not determinately so on a *non-epistemic* conception of indeterminacy under which both classical semantics and classical logic remain valid? In other words: is it intelligible to speak of non-epistemic indeterminate truth?

4. I take the two-slit experiment to be a paradigm case of quantum indeterminacy (see Maudlin 2005 for relevant discussion).

5. See McCall (1994), Belnap *et al.* (2001), MacFarlane (2003), and Greenough, “The Open Future” (unpublished ms.).

6. Williamson (1994, *passim*) also (implicitly) assumes that the validity of classical logic and classical semantics is a necessary condition for a conception of vagueness to be epistemicist. From a terminological point of view, this is unhelpful since there are extant hybrid conceptions of vagueness under which first-order vagueness is taken to be semantic and second-order vagueness is taken to be epistemic (see, e.g., Koons 1994; Heck 2003).

(Hereafter, I will drop the qualification “non-epistemic.”) To vindicate the intelligibility of indeterminate truth, it is necessary to do at least two things. First, one must find some framework within which the notion can be coherently expressed and elucidated. Second, one must show how positing indeterminate truth can do substantial theoretical work—in particular, one must show that indeterminate truth can help us resolve, or at least illuminate, a range of puzzles concerning indeterminacy, such as the sorites paradox, the problem of the many, the open future, the liar paradox, and so on. The focus of this paper is mainly on the first of these tasks, though we shall encounter various applications as we proceed.

The structure of the paper is as follows: in sections 2–4, I survey three extant ways of making sense of indeterminate truth and find each of them wanting.<sup>7</sup> All the later sections of the paper are concerned with showing that the most promising way of making sense of indeterminate truth is via either a theory of *truthmaker gaps* or via a theory of *truthmaking gaps*. The first intimations of a truthmaker–truthmaking gap theory of indeterminacy are to be found in Quine (1981). In section 5, we see how Quine proposes to solve Unger’s problem of the many via positing the possibility of groundless truth. In section 6, I elaborate and extend the truthmaker gap model of indeterminacy first sketched by Sorensen (2001, chap. 11) and use it to give a reductive analysis of indeterminate truth. In section 7, I briefly assess what kind of formal framework can best express the possibility of truthmaker gaps. In section 8, I contrast what I dub “the ordinary conception of worldly indeterminacy” with Williamson’s conception of worldly indeterminacy. In section 9, I show how one can distinguish linguistic from worldly indeterminacy on a truthmaker gap conception. In section 10, I briefly sketch the relationship between truthmaker gaps and ignorance. In section 11, I assess whether a truthmaker gap conception of vagueness is really just a form of epistemicism. In section 12, I propose that truthmaker gaps can yield a plausible model of (semantic) presupposition failure. In section 13, in response to the worry that a truthmaker gap conception of indeterminacy is both parochial and controversial—since it commits us to an implausibly strong theory of truthmaking—I set forth a *truthmaking* gap conception of indeterminacy. In section 14, I answer the worry that groundless truths, of whatever species, are just unacceptably queer. A key part of this answer is that a truthmaker–truthmaking gap model of indeterminacy turns out to be considerably less queer than any model of indeterminacy which gives up on Tarski’s T-schema for truth (and cognate schemas).

## 2. CONCEPTUAL PRIMITIVISM CONCERNING “DETERMINATELY”

Perhaps “determinately” is a conceptually primitive notion, one that cannot be analyzed in more fundamental terms. There are at least two forms such conceptual primitivism might take. On the first form, one grasps the meaning of “determi-

7. This survey is incomplete. In Åkerman and Greenough, “Vagueness and Non-Indexical Contextualism” (unpublished ms.), it is argued that one can also make sense of indeterminate truth given either MacFarlane–Richard style relativism concerning truth or given what MacFarlane calls “Nonindexical Contextualism” (see Richard 2004; MacFarlane 2005, 2008).

nately” by repeated exposure to exemplars of truth-bearers which are determinately true/false and exemplars of truth-bearers which are not determinately true/false (or by exposure to exemplars of determinate cases of  $F$ /not- $F$  and exposure to cases which are neither determinately  $F$  nor determinately not- $F$ ). If bivalence is taken to be valid, then exposure to truth-bearers which are not determinately true/false provides one with a grasp of how a truth-bearer can be true/false but not determinately so. Call that the exemplar model.<sup>8</sup>

The second form of conceptual primitivism has been defended by Field (1994, 2001, 226–34) who alleges that the sentence functor “It is definitely/determinately the case that” is a primitive functor “that we come to understand in the same way we come to understand such operators as negation and disjunction and universal quantification: by learning how to use it in accordance with certain rules” (2001, 227). In other words, Field proposes that we learn how to use “determinately” by coming to grasp the introduction and elimination rules for the operator. Call that inferential primitivism.<sup>9</sup>

With respect to exemplar primitivism, Williamson has argued that, in exhibiting exemplars of determinacy and indeterminacy,

[n]othing has been said to rule out the possibility that “definitely” has acquired an *epistemic* sense, something like “knowably.” If further stipulations are made in an attempt to rule out that possibility, it is not obvious that “definitely” retains any coherent sense (Williamson 1994, 195).<sup>10</sup>

The point being made here is that we can all agree that indeterminacy either gives rise to *or* consists in a particular kind of ignorance. Given this, if I point to a future contingent sentence, for example, with the aim of communicating a non-epistemic understanding of “determinately,” and say “That sentence is neither determinately true nor determinately false” then my declaration is arguably true but, for all I have said, it could be true merely in virtue of the epistemic properties of the sentence. Moreover, it does not help to add “and what makes this sentence lack a determinate truth-value is that the future is objectively open,” for that is compatible with an epistemic reading of “determinately.”

Williamson’s point carries over to inferential primitivism. For all that Field has said, the rules governing “It is determinately the case that” may, as it turns out, confer an epistemic reading onto this operator. In order to ensure that “It is determinately the case that” does not have the same meaning as an operator such as “It is knowable that” (or “It is known that”) then something must be added to the simple inferentialist model proposed by Field.<sup>11</sup> But what could be added to

8. Parsons (2000, 109) also commits himself to primitivism concerning determinacy but from within a non-bivalent framework. See also Hyde (1994, 40).

9. The two sorts of conceptual primitivism are presumably not exclusive.

10. Williamson does not disagree with conceptual primitivism *per se* since he defends such primitivism for “knows” (Williamson 2000).

11. Indeed, the weak modal logic Field seems to have in mind for the determinacy operator (i.e., KTB) is also plausibly the same logic we need for knowledge. Field (2001, 233, final paragraph) is aware of this problem but offers no clue as to how his proposal could be better motivated.

secure a non-epistemic reading short of offering a non-primitive analysis? Moreover, Field is far too hasty in assuming that an explicit analysis of determinacy is not in prospect—conceptual primitivism concerning determinacy is a counsel of despair. So how might we give such an analysis?

### 3. INCOHERENTISM AND INDETERMINATE TRUTH

McGee and McLaughlin (1995, 208–19) propose to offer a reductive analysis of indeterminate truth by alleging that there are two *distinct* and *competing* notions of truth present in natural language: a disquotational notion of truth (truth *simpliciter*) and a correspondence notion of truth (determinate truth). The disquotational notion (for sentence truth) is given to us by all instances of the following version of Tarski's T-schema for truth: If a sentence *S* expresses the proposition that *p* then *S* is true if and only if *p*. Very roughly, the correspondence notion, on the other hand, tells us that (1) the truth-conditions for *S* are established by the thoughts and practices of speakers of the language; and (2) *S* is true just in case the world determines that these conditions obtain. Furthermore, on the view in hand, these two notions of truth “come into conflict” when dealing with sentences which exhibit indeterminacy. That's because the disquotational notion of truth entails that all sentences which say that something is the case have truth-values, while the correspondence notion of truth pushes us to say that some such sentences do not have truth-values. In other words, the rules governing the use of “is true” in natural language are incoherent: we are given conflicting instructions as to how to deploy the truth predicate.<sup>12</sup> Hence, if we want to coherently characterize indeterminacy using the notion of “truth” then either the disquotational or the correspondence notion must be abandoned. As it turns out, McGee and McLaughlin (p.217) propose that we abandon the correspondence notion in favor of the disquotational—at least when it comes to specifying the truth-conditions of sentences which admit of indeterminacy.

On the face of it, McGee and McLaughlin's proposal meets the Wright–Williamson challenge: it is intelligible to speak of indeterminate truth since a sentence can be true in the disquotational sense, but not in the correspondence sense; that is, a sentence can be true but not determinately so. The trouble with this proposal is that a sentence can only be true but not determinately so within a language which is governed by incoherent rules for the use of the truth predicate. But then we have hardly found a coherent way of expressing the possibility of indeterminate truth. A far more plausible view is that there is but one notion of truth, but different *ways* in which a sentence can be true. In other words, determinate truth is not a different species of truth, but rather a different *mode* of truth: being determinately true is a way of being true.<sup>13</sup>

I suspect that the real reason why Field (in his 2001 book at least) is driven to conceptual primitivism for determinacy is his commitment to deflationism concerning truth for he seems to think that a substantial analysis of the notion of determinate truth is bound to draw on inflationary resources. In Field (2003), he is more sanguine about the prospects for analyzing “determinately,” but this is because Field now gives up on classical logic.

12. Cf. Tarski (1944).

13. Cf. Necessary truth as a mode of being true.

#### 4. SLATER ON INDETERMINATE TRUTH

Slater (1989) offers a conception of vagueness under which there is a non-epistemic distinction between indeterminate truth and determinate truth and moreover he also speaks of determinate truth as a mode of being true. Indeed, Slater anticipates the non-standard bivalent form of supervaluation given in McGee and McLaughlin (1995), whereby determinate truth is truth in all admissible interpretations but truth is not determinate truth. With respect to indeterminate truth, Slater says:

what must be expressly allowed for is a situation where a “truth value” is not given. [ . . . ] That does not mean we cannot say the proposition is true or false, for we can always *make* a decision whether someone is, say, bald or not, in any borderline cases—one just decrees or legislates to that effect. [ . . . ] But introducing *this* way of settling whether a proposition is true means we have a new decision to cater for [ . . . ] namely the distinction between central and borderline cases in the application of a concept. This is not now a distinction between cases where “he is bald” has and hasn’t a value but a distinction between the different *backings* there may be for any truth claim in the two cases. In central cases, the criteria for baldness are appealed to and settle the matter; but in borderline cases the criteria for baldness do not settle the matter, and any judgment is conceived as a matter of *choice* (1989, 241–42).

So, a sentence “John is bald” can be true but not determinately so in cases where the criteria for the application of “*bald*,” together with the facts about the number and distribution of hairs on John’s head, do not settle whether the sentence is true, but nonetheless the truth-bearer can be true in virtue of the fact that someone chooses to evaluate the sentence as true. In many respects, this proposal can be read as a precursor of the kind of response-dependent models of vagueness given by Raffman (1994) and Shapiro (2003, 2006) whereby in the borderline area vague sentences are true in virtue of being judged to be true by competent speakers (under normal conditions of judgment). The worry with any such proposal concerns the truth-values of meaningful but vague sentences which have not, and indeed could not, be (competently) judged to be true, because their meaning is far too complex to be contemplated by any speaker of English. It looks like Slater (and Shapiro and Raffman) must take these sentences to lack truth-values despite the fact that these sentences succeed in expressing a proposition. But then classical semantics is no longer valid for all meaningful sentences in the language. Upshot: Slater’s theory of vagueness is not an answer to our question since we wanted to know how indeterminate truth is possible within a (coherent) *classical* framework.

#### 5. QUINE, INDETERMINATE TRUTH, AND THE PROBLEM OF THE MANY

A more promising way to make sense of indeterminate truth is to posit that a truth-bearer can possess a truth-value *groundlessly*. Roughly, truth-bearers which

are indeterminate in truth-value are such that they are either true (*simpliciter*) or false (*simpliciter*); it's just that nothing (in either the world or in thought or in language) grounds the truth-value that they have. The first intimations of such a view (in the modern indeterminacy debate at least) appear in a rather overlooked paper by Quine (1981). In this paper, Quine proposes that Unger's problem of the many (but not all cases of vagueness itself) effectively requires us to recognize the possibility of groundless truth.<sup>14</sup>

Take the case of the table before me. Common sense tells us that there is one and only one table present. Nonetheless, the surface of the table is indeterminately demarcated such that it is unclear, and indeed indeterminate, whether or not a particular molecule belongs to the table. However, it now seems we have many different sets of molecules,  $M_1, M_2, M_3, \dots$  which are all equally good candidates to compose the table. But if that is so then what grounds the fact that a particular set of molecules, say  $M_2$ , composes *the* table rather than any of the others. Indeed, symmetry considerations dictate that if one of the sets of molecules counts as being a table then they all do. Upshot: if one of the sets of molecules composes a table then we have many tables rather than one *or* if we don't have many tables present then we don't have any tables present. Either way, our common-sense intuition must be given up.

Quine's response is as follows:

Where to draw the line between heaps and non-heaps [ . . . ] or between the bald and the thatched, is not determined by the distribution of microphysical states, known or unknown; it remains an open option [ . . . ] On this score the demarcation of the table surface is on a par with the cases of heaps and baldness. But it differs in those cases in not lending itself to any stipulation, however arbitrary, that we can formulate; so it can scarcely be called conventional. It is neither a matter of convention nor a matter of inscrutable but objective fact. Yet we are committed nevertheless, to treating the table as one and not another of this multitude of imperceptibly divergent physical objects. Such is bivalence [ . . . ] What we now observe is that bivalence requires us [ . . . ] to view each general term, e.g. "table," as true or false of objects even in the absence of what we in our bivalent way are prepared to recognise as objective fact. (p. 94)

What this passage intimates is that out of the multitude of overlapping (or nested) table-candidates  $M_1, M_2, M_3, \dots$ , there is indeed but one table. Moreover, that the table-candidate  $M_2$ , say, rather than the table-candidate  $M_1$  or  $M_3, \dots$ , composes the table is something that is not determined by what facts obtain. That is, there is no linguistic fact (such as a linguistic convention) nor any nonlinguistic fact, which determines that  $M_2$ , rather than  $M_1$  or  $M_3, \dots$  composes a table. So, the sentence "The table is composed of  $M_2$ " is a groundless truth, a truth which is not grounded in the facts. One obvious advantage of such a response is that it preserves not only

14. See Unger (1980). Quine seems to have been the first to respond to the problem.

classical logic and classical semantics but common sense. One disadvantage is that it involves denying the following schema:

(FACT) If *S* expresses the proposition that *p* then if *S* is true then it is a fact that *p*.

Whether it is at all plausible to deny FACT (and cognate schemas) is an issue to be addressed in the penultimate section.

## 6. TRUTHMAKER GAPS AND INDETERMINATE TRUTH

Sorensen (2001, 2005a, 2005b), independently of Quine, has outlined a very similar model of groundlessness but instead of talking about an absence of fact, Sorensen speaks of a truthmaker gap.<sup>15</sup> In effect, Sorensen embeds his theory of indeterminacy within the framework of truthmaker theory. In this section, I elaborate and extend Sorensen's model and use it to make sense of indeterminate truth. Consider then the following generic truthmaker principle:

(TM) If a truth-bearer is true then something makes that truth-bearer true.<sup>16</sup>

A strong truthmaker theory enjoins *Truthmaker Maximalism*—the thesis that the schema TM ranges over all truth-bearers. Thus, logical truths, mathematical truths, modal truths, general truths, and negative truths, are all made true by something in the world. Given Truthmaker Maximalism, TM is interderivable, given certain background assumptions, with the following generic falsemaker principle:

(FM) If a truth-bearer is false then something makes that truth-bearer false.

What about the nature of the truthmaking relation expressed in TM/FM? Do truthmakers necessitate, in some sense, that a truth-bearer is true? That is, is *Truthmaker Necessitarianism* called for? A common view is that if a truth-bearer is made true by a truthmaker *T* then the existence of *T* entails that this truth-bearer is true.<sup>17</sup> For the purposes of floating a truthmaker gap theory of indeterminacy, we can remain neutral on this issue—a theory of truthmaker gaps should be

15. Throughout by “truthmaker gap theory of indeterminacy” I mean a *bivalent* truthmaker gap theory (as opposed to a non-bivalent theory which recognizes truthmaker gaps).

16. A closely related principle is: if a truth-bearer is true then there is something in virtue of which it is true. See Rodriguez-Pereyra (2005, 18) who takes the relation “in virtue of” to be primitive.

17. Armstrong accepts that truthmakers necessitate the truth of a truth-bearer. This follows from his view that the truth-making relation is an internal one in the sense that if the relata of the relation exist then the relation necessarily holds of the relata (see Armstrong 2004, 9, 50–51). Armstrong (2004, 10–12) also alleges that the notion of entailment must be suitably non-classical if we are to avoid the problem whereby every truthmaker is a truthmaker for not only every necessary truth but every truth whatsoever. For relevant discussion of this issue, see Restall (1996), Read (2000), Rodriguez-Pereyra (2006).



compatible with either view.<sup>18</sup> With respect to the primary truthmakers, are they facts, states of affairs, events, tropes, bundles of properties, or some other kind of truthmaker? Again, we can remain largely neutral as to the nature of the basic truthmakers. Indeed, it is a key virtue of the truthmaker gap theory of indeterminacy developed here that it is compatible with a wide range of candidate truthmakers and ontological theories. We do, however, need to demand that the primary truthmakers are sufficiently fine-grained. A coarse-grained conception of the truthmakers, whereby, for example, the truthmakers are simply taken to be truth-values will not do for otherwise a theory of truthmaker gaps collapses into a theory of truth-value gaps.<sup>19</sup>

What of the primary truth-bearers? Standard theories of truthmaking typically take the primary truth-bearers to be propositions. In order to give a complete theory of indeterminacy, one which accommodates the possibility of both linguistic and worldly indeterminacy, let the primary truth-bearers be sentences (relativized to contexts), that is sentence-context pairs (hereafter, just “sentences”). TM and FM should be rewritten as:

(TM1) If  $S$  expresses  $\langle p \rangle$  then if  $S$  is true then something makes  $\langle p \rangle$  true.

(FM1) If  $S$  expresses  $\langle p \rangle$  then if  $S$  is false then something makes  $\langle p \rangle$  false.

Here, “ $S$ ” is a quotation name for a declarative sentence relativized to a context, and “ $\langle p \rangle$ ” abbreviates “the proposition that  $p$ .” So, while sentences are the primary truth-bearers, the truthmaking relation itself holds between the primary truthmakers and propositions. A final feature of this strong truthmaker theory is that the following converse conditionals are valid:

(TM2) If  $S$  expresses  $\langle p \rangle$  then if something makes  $\langle p \rangle$  true then  $S$  is true.

(FM2) If  $S$  expresses  $\langle p \rangle$  then if something makes  $\langle p \rangle$  false then  $S$  is false.<sup>20</sup>

Given the strong truthmaker theory just sketched, we are in a position to analyze a notion of determinacy, call this determinacy<sub>1</sub>, as follows:

(D1) If  $S$  expresses  $\langle p \rangle$  then  $S$  is determinately<sub>1</sub> true if and only if something makes  $\langle p \rangle$  true.

(D2) If  $S$  expresses  $\langle p \rangle$  then  $S$  is determinately<sub>1</sub> false if and only if something makes  $\langle p \rangle$  false.

18. See Parsons (1999) for some relevant discussion.

19. Cf. the two notions of fact set forth in Fine (1982). There are good heuristic reasons to take facts to be the primary truthmakers because we want a theory of indeterminacy to make sense of the everyday locution “there is no fact of the matter” (see section 8). The notion of fact defended by Armstrong (1997, 113–18; 2004, 48–49) is suitably fine-grained.

20. Cf. the cognate principles given in Restall (1996, 333), Read (2000, 68).

Given D1/D2, we can now make proper room for a cognate notion of indeterminacy—indeterminacy<sub>1</sub>. (Occasionally, I shall omit the subscript when speaking of indeterminacy/determinacy in some undifferentiated sense or where the context makes clear what species of indeterminacy/determinacy is in play.) To say that a sentence *S* is true/false but not determinately<sub>1</sub> so is just to say that this sentence is true/false but lacks a truthmaker/falsemaker. In other words, there are indeterminate<sub>1</sub> truths/falsities just in case TM1/FM1 failed to be valid. Thus the following principles are central to a truthmaker gap theory of indeterminacy:

(I1) If *S* expresses  $\langle p \rangle$  then *S* is true but not determinately<sub>1</sub> so if and only if *S* is true but there is nothing which makes  $\langle p \rangle$  true.

(I2) If *S* expresses  $\langle p \rangle$  then *S* is false but not determinately<sub>1</sub> so if and only if *S* is false but there is nothing which makes  $\langle p \rangle$  false.

Here the rough idea is that some sentences of the language are meaningful (in that they succeed in expressing propositions and so succeed in being bivalent) and yet the world is somehow factually defective. If the primary truthmakers are facts—then this means that there is no fact of the matter. Hence, there is a failure of correspondence between sentences and the world: when there is a truthmaker gap then there is nothing on the right-hand-side of the correspondence relation. But rather than think this gives rise to a truth-value gap, we should simply see this as a truthmaker gap for a bivalent truth-bearer. As we proceed, I shall try to flesh out just what this involves. First, we need to know just what formal framework is required to model truthmaker gaps.

## 7. THE LOGIC OF DETERMINACY

Suppose that all logical truths have truthmakers.<sup>21</sup> So, for example, the law of excluded middle has a truthmaker. Thus, to borrow the example from above, the following instance of the law of excluded middle has a truthmaker: either the table is composed of the set of molecules  $M_2$  or the table is not composed of the set of molecules  $M_2$ . However, both disjuncts have indeterminate<sub>1</sub> truth-values (despite being bivalent). Given principle I1/I2, both disjuncts are neither made true by something nor made false by something. Thus, we have a disjunction which is made true despite the fact that neither disjunct is made true. In other words, the predicate “is made true by something,” and the sentence functor “Something makes it true that,” are not truth-functional. Nonetheless, “Something makes it true that” is factive. Moreover, this functor also seems to be closed across entailments which are themselves made true. Finally, being neither made true nor made false is formally

21. Indeed, we can allow that Truthmaker Maximalism is valid when TM1 is restricted to those truths which do not admit of indeterminacy<sub>1</sub>. For the purposes of this paper, I remain neutral on whether Truthmaker Maximalism is valid in this way. In Greenough “The Open Future” (unpublished ms.), I employ a supervaluational semantics (for determinate truth, where truth is not determinate truth) under which all logical truths are determinately true and so have truthmakers.

analogous to the property of contingency—being neither necessarily true nor necessarily false.

Given these observations, the resultant logic for a truthmaker gap model of indeterminacy<sub>1</sub> ought to be a normal modal logic, whereby the main modal operator is “It is determinately<sub>1</sub> true that” (“Something makes it true that”), and where classical logic remains valid. If higher-order indeterminacy<sub>1</sub> is not possible, then the logic of determinacy<sub>1</sub> should be KT4 or KT5. If higher-order indeterminacy<sub>1</sub> is possible then the logic should be KT or KTB. Perhaps vagueness calls for the possibility of higher-order indeterminacy<sub>1</sub>.<sup>22</sup> Plausibly, future contingents have indeterminate<sub>1</sub> truth-values; however, there does not seem to be any higher-order indeterminacy<sub>1</sub> attaching to future contingents and so KT4 or KT5 is called for.

In part at least, the Wright–Williamson challenge has been met: it is possible to give a reductive analysis of the distinction between determinate and indeterminate truth, and moreover, we can formally express these notions in a very familiar logical framework. However, in order to get a better grip on the type of indeterminacy under consideration, we also need to know what it is for reality to be indeterminate and what it is for indeterminacy to be “worldly” rather than linguistic.

## 8. WORLDLY INDETERMINACY: WILLIAMSON’S CONCEPTION AND THE ORDINARY CONCEPTION

What is it for reality to be indeterminate? With respect to vagueness in the world, Williamson (2005, 701) says that reality is vague just in case there is “some state of affairs that neither definitely obtains nor definitely fails to obtain.”<sup>23</sup> Extending this to indeterminacy in general, we thus have: there is indeterminacy in reality just in case there is some state of affairs that neither determinately obtains nor determinately fails to obtain.<sup>24</sup> In more generic truthmaker terms, there is indeterminacy in reality just in case there is some truthmaker T such that T neither determinately obtains nor determinately fails to obtain. Call this conception, “Williamson’s conception of worldly indeterminacy.”

On a truthmaker gap conception of indeterminacy, Williamson’s conception is simply incoherent as an account of (first-order) indeterminacy since states of affairs either obtain *simpliciter* or do not obtain *simpliciter*—there is no such thing as an indeterminately obtaining state of affairs (at least if we are solely concerned with first-order indeterminacy). Moreover, Williamson’s account fails to capture the ordinary thought that there is indeterminacy in reality (with respect to the state of

22. See Williamson (1999) for much of the formal details.

23. With respect to states of affairs, he says: “For any object *o* and property *P*, there is a state of affairs that *o* has *P*. For any objects *o*<sub>1</sub> and *o*<sub>2</sub> and any binary relation *R*, there is a state of affairs that *o*<sub>1</sub> has *R* to *o*<sub>2</sub>; it obtains if and only if *o*<sub>1</sub> has *R* to *o*<sub>2</sub>.” Williamson is also assuming that there is a coherent non-epistemic notion of “definitely” for the purposes of uncovering the commitments of non-epistemic theories of vagueness with respect to metaphysical vagueness. He doesn’t really believe that there is such a notion. However, as is argued in section 1, even Williamson must recognize certain kinds of non-epistemic indeterminacy and so there must be such a notion to be elucidated.

24. Parsons (2000, 13) advocates a similar view.

affairs that  $p$ ) just in case there is no fact of the matter as to whether  $p$ . If states of affairs are taken to be the primary truthmakers, what may be termed “the ordinary conception of worldly indeterminacy” then runs as follows: reality is indeterminate just in case there is some state of affairs such that it and its complementary state of affairs both fail to obtain (in the monadic case, the complement of the state of affairs that  $o$  has the property  $P$  is the state of affairs that  $o$  lacks the property  $P$ ). As it is stated, the ordinary conception is silent as to whether bivalence is valid.<sup>25</sup>

The problem with the ordinary conception is that it looks like all indeterminacy in truth-value turns out to be worldly indeterminacy. This worry applies to both a truth-value gap version of the ordinary conception and a bivalent version of the ordinary conception. To simplify, I will focus on the bivalent case.

### 9. MINIMAL VERSUS ROBUST FORMS OF WORLDLY AND LINGUISTIC INDETERMINACY

Say that reality is indeterminate<sub>1</sub> *with respect to* the state of affairs that  $p$  just in case the state of affairs that  $p$ , and the complementary state of affairs that not- $p$ , both fail to obtain. Suppose the sentence  $S$  expresses  $\langle p \rangle$ . From I1/I2 we can infer: if the sentence  $S$  is true/false but not determinately<sub>1</sub> so then  $S$  is true/false but there is nothing which makes  $\langle p \rangle$  true/false. Plausibly, there is nothing which makes  $\langle p \rangle$  true/false if and only if the state of affairs that  $p$ , and the complementary state of affairs that not- $p$ , both fail to obtain. We can then derive: if  $S$  is true/false but not determinately<sub>1</sub> so then the state of affairs that  $p$ , and the complementary state of affairs that not- $p$ , both fail to obtain. And so, given that  $S$  expresses  $\langle p \rangle$ , if  $S$  is true/false but not determinately<sub>1</sub> so then reality is indeterminate<sub>1</sub> in respect of the state of affairs that  $p$ . But now any indeterminacy<sub>1</sub> in truth-value exhibited by a sentence entails indeterminacy<sub>1</sub> in reality.

This certainly doesn't seem right for all possible applications of a truthmaker gap conception of indeterminacy<sub>1</sub>. Consider the case of incomplete stipulations: let a sufficient condition for  $x$  to be a dommal be that  $x$  is a dog; let a necessary condition for  $x$  to be a dommal be that  $x$  is a mammal. This stipulation is incomplete for we have no clear answer to the question: is a cat a dommal?<sup>26</sup> Sorensen (2001, chap. 11) has proposed that the sentence “All cats are dommals” is either true or false but there is nothing which makes it true and nothing which makes it false. If that is so, the indeterminacy exhibited by this sentence seems clearly to be linguistic indeterminacy<sub>1</sub> which arises from features of language and not from any facts concerning the nonlinguistic portion of reality.

To resolve this worry, we need to allow that the indeterminacy<sub>1</sub> of truth-value exhibited by some sentence  $S$  (which expresses  $\langle p \rangle$ ) has two potential sources: either this indeterminacy<sub>1</sub> issues from there being no fact of the matter as to whether  $p$  (in

25. The ordinary conception is a gappy version of worldly indeterminacy. A glutty version runs: reality is indeterminate just in case there is some state of affairs such that it and its complementary state of affairs *both obtain*. A unified theory, which recognizes the possibility of both gaps and gluts in the world, runs: reality is indeterminate just in case there is some state of affairs such that it and its complementary state of affairs either both obtain or both fail to obtain.

26. The example is due to Williamson (1990, 107).

which case it is worldly indeterminacy<sub>1</sub>), or this indeterminacy<sub>1</sub> issues from there being no fact of the matter as to whether *S* expresses  $\langle p \rangle$  (in which case it is linguistic indeterminacy<sub>1</sub>). In other words, we need to recognize that such claims as “*S* expresses  $\langle p \rangle$ ” can themselves have groundless truth-values. The trouble is, the presentation so far has not allowed for this. To illustrate: suppose there *is* a fact of the matter as to whether *p*. That is, either the state of affairs that *p* obtains or the state of affairs that not-*p* obtains. That is, something makes  $\langle p \rangle$  true/false. Thus, reality is determinate<sub>1</sub> (in respect of the state of affairs that *p*). Suppose also that a sentence *S*, which expresses  $\langle p \rangle$ , has a groundless truth-value in virtue of the fact that it is indeterminate<sub>1</sub> whether *S* expresses  $\langle p \rangle$  (and so it is not determinate<sub>1</sub> that *S* expresses  $\langle p \rangle$ ). Suppose further that *S* is true. Recall that D1 tells us that: if *S* expresses  $\langle p \rangle$  then *S* is determinately<sub>1</sub> true if and only if something makes  $\langle p \rangle$  true. Given what has been said, the right-hand side of the biconditional in the consequent of D1 is true, while the left-hand side of the biconditional is false. It follows that *S* does not express  $\langle p \rangle$ . But that contradicts our supposition that *S* does express  $\langle p \rangle$ .

This reveals that the notion of indeterminacy<sub>1</sub> analyzed in D1/D2, and I1/I2 is really just worldly indeterminacy—hence no surprise that all indeterminacy<sub>1</sub> in sentential truth-value entails worldly indeterminacy. This notion of indeterminacy<sub>1</sub> is primary in the explanatory order because facts about language (e.g., about what proposition is expressed by a particular sentence) are themselves, of course, just part of the world. What we need, then, is a notion of *generic* determinacy/indeterminacy of truth-value, which attaches only to linguistic items. Call this determinacy<sub>G</sub>/indeterminacy<sub>G</sub>. First, we can adjust D1 and D2 as follows:

(D1)<sub>G</sub> If it is determinate<sub>1</sub> that *S* expresses  $\langle p \rangle$  then *S* is determinately<sub>G</sub> true if and only if something makes  $\langle p \rangle$  true.

(D2)<sub>G</sub> If it is determinate<sub>1</sub> that *S* expresses  $\langle p \rangle$  then *S* is determinately<sub>G</sub> false if and only if something makes  $\langle p \rangle$  false.

So, when *S* expresses  $\langle p \rangle$ , and *S* is indeterminate<sub>G</sub> in truth-value, but something makes  $\langle p \rangle$  true or something makes  $\langle p \rangle$  false, then it is not determinate<sub>1</sub> that *S* expresses  $\langle p \rangle$ . In such a case, *S* exhibits linguistic indeterminacy. Call that indeterminacy<sub>L</sub>. Equally, suppose *S* has an indeterminate<sub>G</sub> truth-value but that it is determinate<sub>1</sub> that *S* expresses  $\langle p \rangle$ , then *S* exhibits worldly indeterminacy. Call that indeterminacy<sub>w</sub>. More generally, we have:

(IW) A sentence *S* (which expresses  $\langle p \rangle$ ) exhibits indeterminacy<sub>w</sub> if and only if *S* is bivalent but there is nothing which makes  $\langle p \rangle$  true/false (that is, if and only if *S* is bivalent but it is indeterminate<sub>1</sub> whether  $\langle p \rangle$  is true/false).

(IL) A sentence *S* (which expresses  $\langle p \rangle$ ) exhibits indeterminacy<sub>L</sub> if and only if *S* is bivalent but there is nothing which makes  $\langle S$  expresses  $\langle p \rangle$  true/false (that is, if and only if *S* is bivalent but it is indeterminate<sub>1</sub> whether *S* expresses  $\langle p \rangle$ ).

(IG) A sentence *S* (which expresses  $\langle p \rangle$ ) exhibits indeterminacy<sub>G</sub> if and only if it exhibits either indeterminacy<sub>w</sub> or indeterminacy<sub>L</sub> or both.

Take the case of incomplete stipulations. Suppose I introduce the term “bigster” via the following (incomplete) definition: for all natural numbers  $n$ , if  $n \geq 64$  then  $n$  is a bigster and if  $n \leq 62$  then  $n$  is not a bigster. Thus, “bigster” is undefined for 63. Suppose the sentence “63 is a bigster” expresses  $\langle 63 \geq 64 \rangle$ . Then this sentence is false. However, it is fully determinate<sub>1</sub> whether or not  $63 \geq 64$  since there is something which makes  $\langle 63 \geq 64 \rangle$  false. (Truthmaker Maximalism is in play here with respect to those truths which do not admit of indeterminacy.) Suppose the sentence expresses  $\langle 63 \geq 63 \rangle$ . Then this sentence is true. However, it is fully determinate<sub>1</sub> whether or not  $\langle 63 \geq 63 \rangle$  since there is something which makes  $\langle 63 \geq 63 \rangle$  true. Either way, given IW, the sentence does not exhibit indeterminacy<sub>w</sub>. Given that “63 is a bigster” is nonetheless indeterminate in truth-value then, given IG, it exhibits indeterminacy<sub>L</sub>. This is just as we should expect.

Note that if one thinks that the only type of proposition that gets expressed by the sentence “63 is a bigster” is just the disquoted proposition  $\langle 63 \text{ is a bigster} \rangle$  then the analysis yields the wrong results. In particular, we will have the result that there is nothing which makes  $\langle 63 \text{ is a bigster} \rangle$  true/false and so, via IW, “63 is a bigster” will exhibit indeterminacy<sub>w</sub>. Moreover, since it is presumably determinate<sub>1</sub> that “63 is a bigster” expresses  $\langle 63 \text{ is a bigster} \rangle$  then, via IL, “63 is a bigster” does not exhibit indeterminacy<sub>L</sub>. Does this suggest that in applying the analysis across all cases one must never invoke the disquoted proposition on the right-hand side of the expressing relation?

Take the problem of future contingents. Take the sentence “There will be a sea-battle at 12 PM on 31st March 2008.” Suppose there are just two future histories  $h_1$  and  $h_2$  such that it is open which of these histories will come to obtain at the moment of utterance of the sentence. Thus the sentence exhibits indeterminacy<sub>G</sub>. Suppose that the proposition expressed by this sentence is  $\langle \text{A sea-battle takes place at 12 PM on 31st March 2008 on } h_i \rangle$ . Given the two-branch tree structure of actuality, it is determinate<sub>1</sub> whether a sea-battle takes place on 12 PM on 31st March 2008 on  $h_1$ . (That’s because what happens on a future branch is fully determinate since branches are just linear pathways through the tree.) It follows, given IL, that the sentence “There will be a sea-battle at 12 PM on 31st March 2008” does not exhibit indeterminacy<sub>w</sub>. Indeed, since the sentence exhibits indeterminacy<sub>G</sub>, then, via IG, it exhibits indeterminacy<sub>L</sub>. But this gets things the wrong way round. Yet to get things the right way round we have to say that the proposition expressed by our sentence is the disquoted proposition  $\langle \text{A sea-battle takes place at 12 PM on 31st March 2008} \rangle$ . At the time of utterance there is nothing which makes this proposition true/false and so, given IW, the (bivalent) sentence exhibits indeterminacy<sub>w</sub>. Moreover, if it does indeed express the disquoted proposition then is it determinate that it does so. Hence, given IL, the sentence does not exhibit indeterminacy<sub>L</sub>. So, using the disquoted proposition gets matters the right way round in the case of future contingents but the wrong way round in the case of incomplete stipulations.

Does this show that the analysis is *ad hoc*? No. What this shows is that we can and should use intuitions as to what are clear cases of linguistic indeterminacy and what are clear cases of worldly indeterminacy to guide us as to the kind of proposition that may be expressed by some class of sentences. In the case of incomplete stipulations, we have clear intuitions that this is a case of linguistic

indeterminacy, and so the proposition expressed cannot be a disquoted proposition. In the case of future contingents, we have clear intuitions that this is a case of worldly indeterminacy, and so the proposition expressed needs to be the disquoted proposition.<sup>27</sup> Moreover, there are no independent reasons to doubt that the sentence “the table contains molecule  $m_1$  as part” and the sentence “63 is a bigster” express propositions of the same general type. In the absence of such independent reasons, then we have grounds to say that if the former sentence is indeterminate<sub>G</sub> then it exhibits just the same kind of indeterminacy, namely indeterminacy<sub>L</sub>, as is exhibited by the latter sentence.<sup>28</sup> That will be an unwelcome result for some. However, the burden of proof is then on those who deny that such sentences as “the table contains  $m_1$  as part” exhibit robust linguistic indeterminacy (namely, the kind of indeterminacy whose source is in language and not the nonlinguistic part of the world) to offer an alternative framework within which to express the distinction in hand. Moreover, they must do so without appealing to an unanalyzed notion of “determinately.”

How then do truthmaker gaps impact upon knowledge?

## 10. TRUTHMAKER GAPS AND KNOWLEDGE

Suppose we allow that some meaningful sentences express propositions that are neither true nor false. If the truth-value of a sentence, which expresses  $\langle p \rangle$ , is knowable then either  $\langle p \rangle$  is true or  $\langle p \rangle$  is false. So, if  $\langle p \rangle$  is neither true nor false then the truth-value of  $S$  is unknowable (given that  $S$  expresses  $\langle p \rangle$ ). That’s hardly surprising—where there is no truth-value, there can be no knowledge of truth-value. Likewise, where there is no fact of the matter, there can be no knowledge. On a truthmaker gap conception, the following principle is valid:

(K) If  $S$  expresses  $\langle p \rangle$ , then if it is metaphysically possible to know whether or not  $S$  is true then either something exists which makes  $\langle p \rangle$  true or something exists which makes  $\langle p \rangle$  false.

From K, plus TM2, it follows that: if  $S$  expresses  $\langle p \rangle$ , then if it is known that  $S$  is true/false then something makes the proposition that  $p$  true/false.<sup>29</sup>

27. In this latter case, we have independent grounds not to build an argument place for a history into the structure of the proposition expressed since histories are world-like and we don’t build in an argument place for a world (if we did all propositions would be necessarily true).

28. An alternative suggestion to the strategy in hand is to allow that the proposition stated by disquoting “63 is a bigster” is indeterminate in the sense that, whichever proposition this sentence expresses that can be stated that way, it is indeterminate that the sentence expresses that very proposition. So, it is not determinate that “63 is a bigster” expresses that 63 is a bigster. What is determinate is that, whichever proposition “63 is a bigster” expresses, that proposition can be stated by means of disquoting “63 is a bigster”—however, this does not entail that it is determinate that “63 is a bigster” expresses that proposition. (Thanks to Sven Rosenkranz here.)

29. Sorensen (2001, chap.11) holds that truths without truthmakers are “epistemic islands.” By this he means there is no epistemic route (“no trail of truthmakers”) via which we can come to know that they are true. Hence K.

There are three points of note. First, given principle K, God cannot know all truths, just those truths which it is metaphysically possible to know—hence God is not omniscient in the standard sense. For example, if we accept the Quinean solution to the problem of the many, God cannot know the truth-value of the sentence “The table is composed of the set of molecules  $M_2$ .” Equally, if we accept Sorensen’s account of incomplete stipulations, then God cannot know the truth-value of “All cats are dommals.” If future contingents have indeterminate<sub>1</sub> truth-values then God cannot know whether or not a future contingent is true (though he can know whether or not a future contingent is determinately true since determinate truth is just truth in all future histories).<sup>30</sup>

Second, it is common to think that, in some sense, the truths of logic and mathematics are *brutely* true. Does this mean that such truths lack truthmakers in just the same way in which I am assuming that indeterminate truths lack truthmakers? No. Given principle K, all the truths of logic and mathematics would then be unknowable. Hence, if such truths are “brutal,” their brutality is of a different order from that posited by a truthmaker gap theory of indeterminacy. Perhaps such truths have primitive truthmakers as follows: “If  $p$  &  $q$  then  $p$ ” is true in virtue of the fact that: if  $p$  &  $q$  then  $p$  (or true in virtue of the fact that “If  $p$  &  $q$  then  $p$ ” is true). However, indeterminate truths are not even true in virtue of such primitive facts—they lack any kind of truthmaker, primitive or otherwise.

Third, what has just been said reveals important limits to the scope of a truthmaker gap theory of indeterminacy. For example, it looks like such a theory cannot resolve the indeterminacy exhibited in the Kripke–Wittgenstein rule-following paradox.<sup>31</sup> One possible response to the rule-following problem is to hold that the semantic truth “+’ means addition and not quaddition” is a brute truth, a truth whose truth-value does not supervene upon the whole pattern of usage of “+.” But if this just means that this semantic truth is a truth without a truthmaker then, given K, skepticism about meaning is still with us. So, either K must go (and a truthmaker gap solution to the problem is in prospect), or such brutality is compatible with there being a brute truthmaker for the semantic truth in question (perhaps this truth simply supervenes upon the fact that “+” means addition and not quaddition or simply supervenes upon itself). But K seems *prima facie* plausible and so a truthmaker gap model of indeterminacy cannot resolve the Kripke–Wittgenstein rule-following paradox.<sup>32</sup>

30. Wright (2001, 2003) has argued that, in the case of vagueness at least, the status of being borderline does not rule out the possibility of knowledge. For a criticism of this element of his view, see Greenough (2008).

31. See Kripke (1982).

32. Similar remarks apply to Quine’s problem of the indeterminacy of translation (since Quine seems to be right to take his problem to be a special case of the rule-following problem). As it turns out, there may be some scope to deny K in certain cases of indeterminacy, though this is not an issue I can pursue here.



## 11. EPISTEMICISM, THIRD POSSIBILITY VIEWS, AND INDETERMINATE TRUTH

Sorensen (2001) alleges that the truthmaker gap theory of vagueness he puts forward is a form of epistemicism since on this theory vague terms draw sharp but unknowable boundaries across their associated dimension of comparison. Despite the fact that Sorensen coined the term “epistemicism,” his theory is not a form of epistemicism at all. Whether or not a theory of vagueness or indeterminacy counts as an epistemic theory is something which depends on the source of the indeterminacy. All theorists can agree that vagueness gives rise to ignorance; what they disagree about is the source of this ignorance. As mentioned in section 1, the validity of classical logic and classical semantics (and so the resultant commitment to sharp boundaries for vague terms) is not sufficient for a theory of vagueness/indeterminacy to count as epistemic. A theory of vagueness is epistemic if the ignorance exhibited by the relevant truth-bearers is due entirely to our limited powers of discrimination and/or our fallibility as knowers. If some special semantic or metaphysical feature of vague sentences is posited in order to (help) explain the ignorance which is symptomatic of the presence of vagueness then the theory is not an epistemic theory.<sup>33</sup> With respect to Sorensen’s truthmaker gap conception, the boundary drawn by a vague predicate is a groundless boundary—there is no fact in either language or the nonlinguistic portion of reality which determines that it falls in one place rather than another. But this feature of vague predicates, together with principle K, explains why such a boundary is unknowable. Hence, Sorensen’s theory is not a form of epistemicism despite the fact that vague terms draw sharp and unknowable boundaries.

Wright (1995, 2001, 2003) has complained that most extant non-epistemic theories of vagueness are entirely misguided because they assume that being indeterminate in truth-value is a status incompatible with the poles of truth and falsity. Such “third possibility” views (such as a standard three-valued model of indeterminacy or a standard supervaluational model) are misconceived according to Wright since being borderline is a status such that matters have been left open, a status compatible with the poles of truth and falsity.<sup>34</sup> It ought to be clear that a truthmaker gap theory of indeterminacy is not a third possibility view as Wright conceives of such views. However, a truthmaker gap conception is a third possibility view in the sense that indeterminacy is a third status incompatible with the poles of *there being a truthmaker for p* and *there being a falsemaker for p*. That much follows from a commitment to the ordinary conception of worldly indeterminacy.<sup>35</sup> Arguably, however, all that is required for genuine *openness* is that being

33. On this score, it is notable that Williamson’s own form of epistemicism is an *impure* form of epistemicism since Williamson posits a special semantic feature of vague predicates (in addition to our limited powers of discrimination) in order to account for our ignorance in borderline cases, namely that vague predicates have sharp *but unstable* boundaries (see Williamson 1994, 230–37).

34. It’s hard to square this claim with Wright’s other claim, quoted in section 1, that there is no species of indeterminate truth. I put this matter aside.

35. On this score, a bivalent version of the conception of worldly indeterminacy offered by Williamson is not a third possibility view in either sense.

indeterminate is compatible with the poles of truth and falsity and so this particular feature of the view is not problematic.

## 12. SEMANTIC PRESUPPOSITION FAILURE AND INDETERMINATE TRUTH

In addition to incomplete stipulations and vagueness, Sorensen (2001) applies a truthmaker gap model of indeterminacy to the case of the truth-teller paradox (and certain—allegedly—kindred paradoxes). I do not propose to assess the merits of these various applications in this paper.<sup>36</sup> Various other applications suggest themselves. Here I consider just one: (semantic) presupposition failure.<sup>37</sup> On the standard semantic account of presupposition, for all sentences *S* and *R*, which say that something is the case, *S* (semantically) presupposes *R* just in case, necessarily, if *S* is true/false then *R* is true. So, if the presupposition *R* is false then *S* is neither true nor false (despite still expressing a proposition).<sup>38</sup> While the semantic account is certainly problematic in that it cannot account for all the data, one of its biggest drawbacks is that classical semantics and classical logic are invalidated.<sup>39</sup> Can we do better?

If *S* does lack a truth-value, then via TM2/FM2, the proposition expressed by *S* lacks a truthmaker and a falsemaker. In other words, on the standard truth-value gap account, *S* is “factually defective” if *R* is false. (Here the standard account entails the ordinary conception of worldly indeterminacy.) But a truthmaker gap conception of indeterminacy allows us to respect the intuition that *S* is factually defective, if *R* is false, without giving up on bivalence. A proto truthmaker gap account (which is as yet neutral as to whether classical semantics is valid) runs as follows: for all sentences *S* and *R*, which say that something is the case, *S* (semantically) presupposes *R* just in case, necessarily, if there is something which makes the proposition expressed by *S* true/false then *R* is true. This proto truthmaker gap theory of semantic presupposition is equivalent to the truth-value gap theory given the validity of TM1/FM1 and TM2/FM2. If TM1/FM1 is given up because of the observation that sentences with false presuppositions are factually defective but nonetheless bivalent, then the proto theory becomes a proper (classical) truthmaker gap theory of semantic presupposition. And so we have: for all sentences *S* and *R*, which say that something is the case, if *S* (semantically) presupposes *R* and *R* is false then *S* remains bivalent but there is nothing which makes the proposition expressed by *S* true/false. As we shall see in the penultimate section, positing truth-value gaps is more queer than positing truthmaker gaps. For that reason, if one is tempted to think that a semantic account of presupposition still has legs

36. See Greenough (forthcoming), for reasons to think that truthmaker gaps/truthmaking gaps cannot illuminate the nature of the truth-teller (and the nature of the so-called “no-no paradox”).

37. See Greenough, “The Open Future” (unpublished ms.) for an application of truthmaker (and truthmaking) gaps to the case of future contingents.

38. See Strawson (1952, 175ff), van Fraassen (1966, 1968).

39. See Karttunen (1973), Schwarz (1977) on the so-called “projection problem” for compound sentences.

(in the face of various competing pragmatic accounts) then one should plump for the (bivalent) truthmaker gap version.

### 13. TRUTHMAKING GAPS AND INDETERMINATE TRUTH

A truthmaker gap conception of indeterminacy may be felt to be both controversial and parochial owing to the fact that Truthmaker Maximalism is nonetheless taken to hold for all truths which do not admit of indeterminacy. In this section, we will gradually retreat from Truthmaker Maximalism in order to find a theory of indeterminacy which is compatible with certain (allegedly) less controversial conceptions of truthmaking.

The first point of retreat is to the following claim: where  $S$  expresses a contingent truth, the absence of a truthmaker for  $S$  is both necessary and sufficient for  $S$  to be true but not determinately so. (And so, principles D1/D2 remain valid for contingent truths and so TM1/FM1 are thereby valid when restricted to contingent truths which do not admit of indeterminacy.) Even though that makes the theory of indeterminacy on offer somewhat less parochial, it is still incompatible with all conceptions of truthmaking whereby so-called “negative truths” are truths without truthmakers.

Take an utterance of the negative existential “There are no dodos.” Suppose that this utterance is determinately true. Given D1, this truth has a truthmaker. But what sort of thing could make this negative claim true? Equally, what sort of entity could make an utterance of the positive existential “There are dodos” false? If facts are taken to be the primary truthmakers, then the quick answer is: negative facts. Many have balked at positing such facts.<sup>40</sup> An alternative response is to restrict the scope of the principles TM1, D1, and I1 to so-called “positive truth-bearers” with the upshot that FM1, D2, and I1 are no longer derivable from the newly restricted versions of TM1, D1, and I1, respectively.<sup>41</sup>

Thus, the proposition expressed by the sentence “There are no dodos” is a truth without a truthmaker and the proposition expressed by the sentence “There are dodos” is a falsity without a falsemaker. With respect to giving a truthmaker gap theory of indeterminacy, the result is that being true but lacking a truthmaker is a necessary but not a sufficient condition for being true but not determinately so. Nonetheless, we can still have the following three clauses: (1) a positive truth-bearer is a truth without a truthmaker if and only if this positive truth-bearer is true but not determinately so; (2) a positive truth-bearer is true but not determinately so if and only if the corresponding negative truth-bearer is false but not determinately so; and (3) a negative truth-bearer is true but not determinately so if and

40. Russell famously thought it necessary to posit such negative facts. Armstrong (2004, chap. 5) argues that we can get by with so-called “totality facts.” Equally, one might seek to defend what Armstrong calls “the incompatibility solution” whereby, assuming propositions to be the truth-bearers, for every negative truth  $\text{not-}p$ , there is a positive truth  $q$  which is incompatible with  $p$  such that the truthmaker for this positive truth is thereby a truthmaker for the negative truth  $\text{not-}p$  (see Armstrong 2004, 60–63 for a critical discussion of the incompatibility solution).

41. The character “Mid” in Simons (2000) suggests that TM1 should be restricted to atomic, and so to positive, truths.

only if the corresponding positive truth-bearer is false but not determinately so. The trouble with this proposal is that there are no clear criteria to distinguish positive from negative truth-bearers—either when utterances of sentences or propositions are taken to be the primary truth-bearers.<sup>42</sup>

A further solution to the problem of negative truthmakers is to adopt the following disjunctive version of the truthmaker principle:

(TM-v) If  $S$  expresses the contingent proposition that  $p$  then *either* (necessarily) if  $S$  is true then something makes  $\langle p \rangle$  true *or* (necessarily) if  $S$  is false then something makes  $\langle p \rangle$  false.<sup>43</sup>

This principle can be taken to range over both positive and negative truthmakers and so there is no call for a principled distinction between these species of truth-bearer. Suppose that  $S$  is the negative existential “There are no dodos.” Let’s concede that the proposition expressed by this sentence is a truth without a truthmaker. It follows that the left disjunct of TM-v fails. Nonetheless, the right disjunct holds because in all worlds where the sentence is false there will be a falsemaker for the proposition expressed by this sentence, namely the existence of at least one dodo. The key thesis of a truthmaker gap theory of indeterminacy thus becomes: a sentence (which expresses a contingent proposition) is indeterminate in truth-value just in case this sentence is a counterexample to TM-v. That is:

(I3) If  $S$  expresses the contingent proposition that  $p$  then  $S$  is indeterminate in truth-value if and only if  $S$  is true but  $\langle p \rangle$  lacks a truthmaker or  $S$  is false but  $\langle p \rangle$  lacks a falsemaker.

The trouble with TM-v is that there are disjunctive claims that are counterexamples to TM-v and yet these claims are perfectly determinate in truth-value. Take the disjunctive proposition  $\langle$ there is a dodo or there are no arctic penguins $\rangle$ . Since there are no dodos then the left disjunct is false and so not made true. Nonetheless, the right disjunct is true. But, given that negative truthmakers are not admissible, the right disjunct is a truth without a truthmaker. Either way, both disjuncts are not made true and so the disjunction is a truth without a truthmaker. Suppose that the disjunction is false—hence both disjuncts are false. The left disjunct is not made false because there is no negative fact to make the disjunct false. But a disjunction is made false only if both disjuncts are made false and so the disjunction is thus false but lacks a falsemaker. Thus, the disjunction in hand is a counterexample to TM-v despite being determinate in truth-value.<sup>44</sup> (More complex counterexamples can be found whereby the main connective of the sentence is a conjunction or a conditional.) One way of addressing that problem is to restrict the scope of TM-v to sentences whose logical form is not expressed using  $\&$  or  $\vee$  or  $\rightarrow$  (or any other

42. See Dummett (2006, 7–8).

43. Parsons (2005, 168) offers a distinct but related disjunctive formulation of the truthmaker principle: “for all truths  $p$ , either  $p$  has a truthmaker, or  $p$ ’s negation would have a truthmaker, were it true.”

44. Here I improve upon a counterexample of Parsons (2005, 168).

binary connectives such as the Scheffer stroke). Thus,  $S$  is indeterminate in truth-value just in case  $S$  expresses a contingent and non-binary bivalent proposition which whenever it is true it lacks a truthmaker and whenever it is false it lacks a falsemaker. The trouble with this suggestion is that just as we lack clear criteria for distinguishing positive from negative truth-bearers, we lack clear criteria for distinguishing sentences whose logical form is canonically expressed using a binary logical connective and sentences whose logical form is canonically expressed using a unary connective. So, it's hard to see how TM-v could be appropriately restricted.

One popular response to these (and related) worries is to retreat to some version of Bigelow's slogan: *truth supervenes upon being*, where this slogan applies to contingent truth only. Suppose that being is constituted by what things there are then this slogan articulates the following claim: "If something is true, then it would not be possible for it to be false unless either certain things were to exist which don't, or else certain things had not existed which do" (Bigelow 1988, 133). When sentences, rather than propositions, are taken to be the primary truth-bearers then this principle becomes:

(SUP1) If a sentence  $S$  expresses a contingent proposition then the truth-value of  $S$  supervenes upon what things there are.

We have been assuming all along that " $S$ " denotes a sentence-context pair, where a context determines a world. For this reason, SUP is best expressed as follows: if a sentence type  $s$  is true (relative to a use in a world  $W$ ) but false (relative to a use in a world  $V$ ) then there is a difference in population between these worlds: either something exists in  $W$  but not  $V$  or something exists in  $V$  but not  $W$ . The truth-value of  $s$  may differ relative to the two uses for three reasons: either the use of  $s$  expresses a different proposition across the two uses, or the subject matter of the proposition expressed by the use of  $s$  differs across the two uses, or both these scenarios obtain. Roughly, a difference in truth-value entails a difference in meaning or a difference in fact (or both).

Suppose instead that being is taken to be constituted by what things there are *and* how those things are, then the Bigelow slogan articulates the following claim: if a truth-bearer differs in truth-value across worlds then either a particular or a universal exists in one but not the other of these worlds or there is a difference in the pattern of instantiation of particulars and universals (see Bigelow 1988, 38; Dodd 2002, 73–81; Lewis 1999, 206; 2001, 613). So, we have:

(SUP2) If  $S$  expresses a contingent proposition then the truth-value of  $S$  supervenes upon what things there are and how those things are.

So, if a sentence type  $s$  is true (relative to a use in a world  $W$ ) but false (relative to a use in a world  $V$ ) then that need not entail a difference in population between  $W$  and  $V$ , but simply a difference in the pattern of instantiation of the fundamental properties and relations shared between the two worlds.

Like TM-v, both SUP1 and SUP2 do not require us to posit negative truthmakers thus allowing that some contingent truths do not have truthmakers. If

“There are dodos” is true (as used in *W*) but not true (as used in *V*), and this sentence expresses the same proposition in both worlds, this merely entails that something—the sum of all dodos—exists in *W* but not *V*. It does not entail that something else—the absence of dodos—exists in *V* but not *W*. Better still, unlike *TM-v*, both *SUP1* and *SUP2* do not need to be restricted to atomic truth-bearers.

It’s a further question as to whether *SUP2* is preferable to *SUP1*. One reason to prefer *SUP2* over *SUP1* is because *SUP1* depends on the somewhat contentious idea that reality is simply a collection of objects such that to furnish an inventory of these objects is to give an exhaustive characterization of reality.<sup>45</sup> Another, and stronger, reason to prefer *SUP2* over *SUP1* is that *SUP2* permits a more parsimonious ontology since, given *SUP2*, every difference in being need not be a difference in population. Even though for the purposes of giving a theory of indeterminacy we can remain neutral on this vexed issue, I propose that *SUP2* is taken to be the canonical truthmaking principle on the grounds that it is neutral between a wide range of ontological theories. The result is that we can make room for truthmaking without truthmakers.<sup>46</sup> A difference in truth-value need not entail a difference in what things there are but simply a difference in the pattern of instantiation of what particulars and universals that there are.

We are now in a position to articulate a far less parochial model of determinacy—call this *determinacy*<sub>2</sub>—and indeterminacy—call this *indeterminacy*<sub>2</sub>. First, we have the following (equivalent) principles:

(D3) If *S* expresses a contingent proposition then *S* is determinately<sub>2</sub> true if and only if *S* is true and the truth-value of *S* supervenes upon what things there are and how those things are.

(D4) If *S* expresses a contingent proposition then *S* is determinately<sub>2</sub> false if and only if *S* is false and the truth-value of *S* supervenes upon what things there are and how those things are.<sup>47</sup>

Given D3 and D4, to say that a sentence is true/false but not determinately<sub>2</sub> so is to say this it is true/false but its truth-value does not supervene upon what things there are and how those things are. And so we have:

(I4): If *S* expresses a contingent proposition then *S* is indeterminate<sub>2</sub> in truth-value if and only if *S* is either true or false but *S*’s truth-value does not supervene upon what things there are and how those things are.<sup>48</sup>

45. Williamson (2005, 705–6) makes just this complaint.

46. See Melia (2005, 78–84) for a rather intriguing nominalistic truthmaking theory which allows there to be truthmaking without truthmakers without any commitment to a modal principle like *SUP2*.

47. These principles are equivalent given that they range over both atomic and non-atomic truth-bearers. They also permit logical truths/falsities to be determinately<sub>2</sub> true/false (which allows, but does not require, the logic of *determinacy*<sub>2</sub> to be a normal modal logic).

48. While there are strong hints of a truthmaker–truthmaking gap theory of indeterminacy in McGee and McLaughlin (1995), McLaughlin (1997), and McGee and McLaughlin (2004), it is clear that these authors (see esp. their 2004, 126–27) accept that whether or not a truth-bearer is true

So, on this conception, sentences which are indeterminate<sub>2</sub> in truth-value are counterexamples to SUP2.<sup>49</sup> So, there is a world W and a world V such that the sentence type *s* is true (relative to a use in W) yet false (relative to a use in V) and yet W and V are indiscernible. On this interpretation, a sentence is indeterminate in truth-value just in case it gives rise to truthmaking, rather than truthmaker, gaps. There are thus three classes of (contingent) sentences: those whose truth-values are supervenient and true, those whose truth-values are supervenient and false, and those that fall in the truthmaking gap, as it were, such that their truth-value does not supervene upon what things there are and how those things are. Ungrounded truth (indeterminate<sub>2</sub> truth) is not a distinct species of truth, it is simply a mode of truth—a way of being true. Likewise for grounded truth.

We have now made room for a species of indeterminate truth, namely indeterminate<sub>2</sub> truth, within a far less parochial framework of truthmaking, a framework which is arguably available to most partisans as to the nature of being. Again, the Wright–Williamson challenge has at least been partly met: indeterminate truth is a (*prima facie*) intelligible notion.<sup>50</sup> To make the notion somewhat more intelligible it is necessary to answer what I term *the queerness objection*.

#### 14. THE QUEERNESS OBJECTION

The two models of indeterminacy on offer are hostage to what may be termed *the queerness objection*. This objection runs: to reject (or restrict) the thesis that the truth of a sentence supervenes upon what things there are and how those things are is to give up on a platitude concerning the most minimal relationship between language and the world. To do so is to posit a class of sentences whose truth-values float free in a void. That's just unacceptably queer.<sup>51</sup> Equally, to allow that a sentence, which expresses  $\langle p \rangle$ , is true but that there is no fact of the matter as to whether *p* is, again, just unacceptably queer. Though this objection is well taken, there is a package of responses that can be marshalled in response.

*Response One:* In the first place, queerness is to be expected—the truth about indeterminacy must be strange. All theories of indeterminacy—however, prepossessing—have a bump in the carpet.<sup>52</sup> Whether such queerness is unacceptable depends, in part, on the corresponding virtues exhibited by the theory in

depends only on what the world is like such that the truth-value of this truth-bearer supervenes upon what things there are and how those things are. Hence, these authors explicitly do *not* offer a truthmaking–truthmaker gap theory of indeterminacy despite wishing to draw a distinction between indeterminate truth and determinate truth.

49. Cf. Sorensen (2001, 173–74).

50. Just as with a truthmaker gap model of indeterminacy, a truthmaking gap model opposes an analogue of Williamson's conception of worldly indeterminacy discussed in section 8. A classical version of this analogue is that reality is indeterminate just in case there is a world W and a world V such that a use of the sentence type *s* is true in W but a use of *s* in V is not true and yet *it is indeterminate whether* W and V are indiscernible.

51. McBride (2005, 122), for one, alleges that it is a “near truism” that “there cannot be a difference in the truth-value of a proposition without a difference in its subject matter.”

52. Cf. Williamson's remark “the truth about vagueness must be strange” (Williamson 1994, 166).

question. The key virtues of a truthmaker–truthmaking gap conception are manifold. In summary, they are: (1) Classical semantics is preserved, most notably bivalence, Tarski’s T-schema, and the disquotational schema for predicate denotation (and cognate schemas). (2) Classical logic is preserved in its entirety. The result is a theory which has the methodological virtues of simplicity, explanatory power, past success, and a high degree of integration with theories from other domains.<sup>53</sup> Furthermore, since one cannot always read off from the syntax or logical form or meaning of a sentence whether or not it is (extensionally) indeterminate in truth-value, those theories of indeterminacy which recommend restricting classical logic face the following dilemma: should one proceed cautiously and reason in the restricted logic or should one take a risk and reason in classical logic?<sup>54</sup> A truthmaker–truthmaking gap theory of indeterminacy faces no such dilemma since it is always safe to reason classically in the face of potential indeterminacy.

*Response Two:* Suppose the canonical truthmaker principle is read as follows: for any worlds *W* and *V*, if some proposition *p* is true in *W* but not in *V* then something exists in *W* but not in *V* (and so the principle is a “two-way” difference-making principle). To allow for the possibility of indiscernible worlds, Lewis (2001) proposes what he takes to be an “easy and harmless” amendment to the truthmaker principle so read:

Let a *discerning* proposition be one that never has different truth-values in two indiscernible worlds; understand [the truthmaker principle] to be restricted to discerning propositions. (Lewis 2001, 606)

But now note that Lewis’s notion of a discerning proposition is effectively one way of expressing the notion of a determinate proposition. An indeterminate (or indiscerning) proposition, accordingly, can take different truth-values in two indiscernible worlds. Lewis’s “easy and harmless” restriction of (a propositional version of) the truthmaker principle is thus entirely analogous to a truthmaker–truthmaking gap strategy of allowing for indeterminacy. (This helps us locate a potential source of the anxiety over the queerness of truthmaker–truthmaking gap, namely the possibility of indiscernible worlds.)

*Response Three:* As we saw in sections 2–4 above, a truthmaker–truthmaking gap theory is the only theory of indeterminacy which goes any way to making sense of the distinction between determinate truth and indeterminate truth in a classical framework. All other classical theories of indeterminacy considered are, it has to be said, conspicuous failures in this respect.

*Response Four:* A truthmaker–truthmaking gap theory is methodologically principled. Given a philosophical conundrum, one should revise one’s philosophy before one revises one’s logic. In general, one should be bold and adopt classical

53. The methodological virtues of classical logic/semantics are endorsed by Quine (1981), Sorensen (1988, 2001, 8–20), and Williamson (1994, 186).

54. The scenario of risk here is, of course, taken from Kripke (1975), though Kripke doesn’t go on to motivate the dilemma just given.



logic from the outset in one's philosophical investigations—otherwise one is destined to fail to properly investigate and develop all the theories of indeterminacy under which classical logic is preserved.<sup>55</sup> A truthmaker–truthmaking gap theory respects such a bold methodology since it merely restricts a piece of metaphysics, namely, either the thesis TM1 or the thesis SUP2 (or both).<sup>56</sup>

*Response Five:* In fact a *much* stronger methodological argument in favour of a truthmaker gap theory of indeterminacy is in the offing. To illustrate the point let me tell a story about how things might have turned out. Return to the beginnings of the modern indeterminacy debate sometime around 1918.<sup>57</sup> Picture Łukasiewicz deciding how to respond to the indeterminacy exhibited by future contingent sentences. Assume that he is right to think that this indeterminacy is non-epistemic. But imagine, contrary to fact, that he was able to consider the following two options:

*Option One:* Give up on classical logic and allow for truth-value gaps. Furthermore these gaps are to be modelled in the now very familiar three-valued truth-functional (Łukasiewicz) matrices (the intermediate status being “neither true nor false”).

*Option Two:* Retain classical logic and allow for truthmaker gaps. Furthermore, these gaps are to be modelled in the now very familiar three-valued truth-functional (Łukasiewicz) matrices (the intermediate status being “no fact of the matter”).

Łukasiewicz first supposes that Option One is correct. He supposes further that truth is the “strong” notion of truth whereby if a proposition is neither true nor false then the claim that this proposition is true is itself false. It follows that the following version of (one half of) the Tarski’s T-schema (with respect to propositional truth) is invalid since there is a “drop” in truth-value from antecedent to consequent:<sup>58</sup>

(TRUTH) If  $p$  then it is true that  $p$ .

Now he supposes instead that Option Two is correct and notes that the following schema will be invalid.

(FACT) If  $p$  then it is a fact that  $p$ .

Łukasiewicz remains unsure which option to choose. Does he deny the (semantic) principle TRUTH or the (metaphysical) principle FACT? Either option seems to

55. These methodological strictures are due to Williamson (1997). See also Sorensen (2001, 8–20).

56. So, even though Williamson intended these methodological strictures to push us towards embracing epistemicism in the vagueness debate, they do no such thing in the indeterminacy debate at large given the possibility of non-epistemic bivalent models of indeterminacy.

57. See McCall (1967).

58. See Dummett (1978, 233).

him a queer way to go. Nonetheless, if future contingents really are non-epistemically indeterminate in truth-value then choose he must. He runs through all the reasons mooted above in favour of Option Two but finds them insufficient to persuade him. Lurking in his mind here is the feeling that it is a lot *more* queer to deny FACT than it is to deny TRUTH such that these reasons cannot offset the oddity of denying FACT. He begins to veer towards choosing Option One but before he does so he reflects upon whether the following schema is valid:

(LINK) If it is a fact that  $p$  then it is true that  $p$ ,

and concludes that LINK is indeed valid. LINK strikes Łukasiewicz as valid because: (1) given Option Two, LINK is not in any case under any threat; and (2) given Option One, although it might be thought that LINK should be given up along with TRUTH, this is not so. His reason for thinking this is that a truth-value gap conception needs LINK to explain why there is no fact of the matter as to whether  $p$  when neither  $p$  nor  $\text{not-}p$  is true. (Here Łukasiewicz finds no plausibility in Williamson's conception of worldly indeterminacy but takes the ordinary conception of worldly indeterminacy to be the default view.)

Łukasiewicz now notices that FACT plus LINK entail TRUTH. And so he realizes that if he takes Option One he will be not only committed to denying a *prima facie* plausible principle governing truth (namely TRUTH) but he will also be committed to denying a *prima facie* plausible principle concerning the relationship between propositions and the world (namely FACT). So, Option One strikes him as doubly queer. Indeed, he realizes that any logical theory in the future which abandons TRUTH will be in exactly the same predicament. He then notes that while a denial of FACT is indeed considerably queer, it is still much less queer to choose Option Two rather than Option One (at least if the ordinary conception of worldly indeterminacy is correct whereby indeterminacy consists in there being no fact of the matter). So, he proceeds to model future contingents using truthmaker gaps and uses his three-valued matrices to demonstrate, for example, that the claim that "Either it will rain tomorrow or it will not" is true but nothing makes it true since nothing makes either disjunct true.<sup>59</sup> Looking back after many years he feels relieved not to have led the Academy astray by positing such doubly queer things as truth-value gaps.

Of course things did not turn out this way. Since the 1920s, three-valued logics, many-valued logics, and their cousins (such as standard supervaluational logic) have proliferated and flourished. As we have just seen, under certain assumptions, a large class of such logics are doubly queer. For this reason, the modern indeterminacy debate got off on the wrong foot by being committed to far

59. The three-valued tables commit Łukasiewicz to a compositional model of indeterminacy whereby if both disjuncts of a disjunction are indeterminate then the disjunction is indeterminate. Thus, on such a view Truthmaker Maximalism is ruled out since the law of excluded middle lacks a truthmaker when both disjuncts do. In section 7, in contrast, a compositional model of indeterminacy was ruled out because Truthmaker Maximalism was taken to be valid for all sentences which do not admit of indeterminacy and hence the route to a normal modal logic of determinacy.

more deviancy and queerness than is required to make sense of indeterminacy.<sup>60</sup> Once this is realized, the queerness objection against truthmaker gaps (and truth-making gaps) loses much if not most of its force.

## 15. CONCLUSION

To vindicate the intelligibility of indeterminate truth one must find a coherent framework within which this notion can be expressed and elucidated. One must also show how the notion can help resolve, or illuminate, a range of puzzles and paradoxes concerning indeterminacy. I hope to have gone some way to meeting the first of these demands via the idea that a truth-bearer can have a groundless truth-value, where such groundlessness is explained via a theory of truthmaker gaps or via a theory of truthmaking gaps. In so doing, I hope to have made some sense of the distinction between linguistic indeterminacy and worldly indeterminacy. The second challenge is taken up elsewhere.<sup>61,62</sup>

## REFERENCES

- Åkerman, J., and Greenough, P. Unpublished. "Vagueness and Non-Indexical Contextualism." ms.
- Armstrong, D. 1997. *A World of States of Affairs*. Cambridge: Cambridge University Press.
- . 2004. *Truth and Truthmaking*. Cambridge: Cambridge University Press.
- Belnap, N. 2001. *Facing the Future: Agents and Choices in Our Indeterminist World* (with Michael Perloff and Ming Xu). Oxford: Oxford University Press.
- Bigelow, J. 1988. *The Reality of the Numbers: A Physicalist's Philosophy of Mathematics*. Oxford: Clarendon Press.
- Dodd, J. 2002. "Is Truth Supervenient on Being?" *Proceedings of the Aristotelian Society* 102: 69–86.
- Dummett, M. A. E. 1975. "Wang's Paradox." *Synthese* 30: 301–24.
- . 1978. *Truth and Other Enigmas*. London: Duckworth.
- . 2006. *Thought and Reality*. Oxford: Oxford University Press.
- Field, H. 1994. "Disquotational Truth and Factually Defective Discourse." *Philosophical Review* 103: 405–52.
- . 2001. *Truth and the Absence of Fact*. Oxford: Oxford University Press.
- . 2003. "A Revenge-Immune Solution to the Semantic Paradoxes." *Journal of Philosophical Logic* 32: 39–77.
- Fine, K. 1975. "Vagueness, Truth, and Logic." *Synthese* 30: 265–300.
- . 1982. "First-order Modal Theories III—Facts." *Synthese* 53: 43–122.

60. Certain "gappy" theories allow Tarski's T-schema to be valid by introducing a new conditional into the language (see, e.g., Field 2003) and so are not subject to the argument in the text. Even so, the law of excluded middle is given up. In the case of future contingents at least, this has no plausibility whatsoever, since "either a sea-battle will happen or not: a sea-battle will happen" ought to be valid on any promising conception of future contingents. Likewise, for the quasi-tautology "Either it will happen or it won't."

61. See Greenough (forthcoming), Greenough "The Open Future" (unpublished ms.).

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- Greenough, P. 2008. "On what it Is to Be in a Quandary." *Synthese* DOI 10.1007/s11229-008-9317-7.
- . Forthcoming. "Truthmaker Gaps and the No-No Paradox." *Philosophy and Phenomenological Research*.
- . Unpublished. "The Open Future." ms.
- Heck, R. 2003. "Semantic Accounts of Vagueness." In *Liars and Heaps*, ed. J. C. Beall, 106–27. New York: Oxford University Press.
- Hyde, D. 1994. "Why Higher-order Vagueness is a Pseudo-problem." *Mind* 103: 35–41.
- Karttunen, L. 1973. "Presuppositions of Compound Sentences." *Linguistic Inquiry* IV, 169–93.
- Keefe, R. 2000. *Theories of Vagueness*. Cambridge: Cambridge University Press.
- Koons, R. 1994. "A New Solution to the Sorites Problem." *Mind* 103: 439–49.
- Kripke, S. 1975. "Outline of a Theory of Truth." *Journal of Philosophy* 72: 690–716.
- . 1982. *Wittgenstein on Rules and Private Language*. Cambridge, MA: Harvard University Press.
- Lewis, D. 1999. "A World of Truthmakers?" In *Papers in Metaphysics and Epistemology*, 215–20. Cambridge: Cambridge University Press.
- . 2001. "Truthmaking and Difference-making." *Noûs* 35: 602–15.
- MacFarlane, J. 2003. "Future Contingents and Relative Truth." *The Philosophical Quarterly* 53: 321–36.
- . 2005. "Making Sense of Relative Truth." *Proceedings of the Aristotelian Society* 105: 321–39.
- . 2008. "Nonindexical Contextualism." *Synthese* DOI 10.1007/s11229-007-9286-2.
- McBride, F. 2005. "Lewis's Animadversions on the Truthmaker Principle." In *Truthmakers: The Contemporary Debate*, ed. H. Beebe and J. Dodd, 117–40. Oxford: Oxford University Press.
- McCall, S., ed. 1967. *Polish Logic 1920–1939*. Oxford: Oxford University Press.
- . 1994. *A Model of the Universe*. Oxford: Oxford University Press.
- McGee, V., and McLaughlin, B. 1995. "Distinctions without a Difference." *Southern Journal of Philosophy* 33 (Supplement): 204–51.
- . 2004. "Logical Commitment and Semantic Indeterminacy: A Reply to Williamson." *Linguistics and Philosophy* 27: 221–35.
- McLaughlin, B. 1997. "Supervenience, Vagueness, and Determination." *Philosophical Perspectives* 11: 209–39.
- Maudlin, T. 2005. "Metaphysics and Quantum Physics." In *The Oxford Handbook of Metaphysics*, ed. M. Loux and D. Zimmerman, 461–87. Oxford: Oxford University Press.
- Melia, J. 2005. "Truthmaking without Truthmakers." In *Truthmakers: The Contemporary Debate*, ed. H. Beebe and J. Dodd, 67–84. Oxford: Oxford University Press.
- Parsons, J. 1999. "There is no 'Truthmaker' Argument against Nominalism." *Australasian Journal of Philosophy* 77: 325–34.
- Parsons, J. 2005. "Truthmakers, the Past, and the Future." In *Truthmakers: The Contemporary Debate*, ed. H. Beebe and J. Dodd, 161–74. Oxford: Oxford University Press.
- Parsons, T. 2000. *Indeterminate Identity*. Oxford: Oxford University Press.
- Quine, W. V. O. 1981. "What Price Bivalence?" In *Theories and Things*, 31–37. Cambridge, MA: Harvard University Press.
- Raffman, D. 1994. "Vagueness without Paradox." *Philosophical Review* 103: 41–74.
- Read, S. 2000. "Truthmakers and the Disjunction Thesis." *Mind* 109: 67–99.
- Restall, G. 1996. "Truthmakers, Entailment, and Necessity." *Australasian Journal of Philosophy* 74: 331–40.
- Richard, M. 2004. "Contextualism and Relativism." *Philosophical Studies* 119: 215–42.
- Rodriguez-Pereyra, G. 2005. "Why Truthmakers?" In *Truthmakers: The Contemporary Debate*, ed. H. Beebe and J. Dodd, 17–31. Oxford: Oxford University Press.
- . 2006. "Truthmaking, Entailment, and the Conjunction Thesis." *Mind* 115: 957–82.
- Schwarz, D. S. 1977. "On Pragmatic Presupposition." *Linguistics and Philosophy* 1: 247–57.
- Simons, P. 2000. "Truthmaker Optimalism." *Logique et Analyse* 43 (169–70): 17–41.
- Shapiro, S. 2003. "Vagueness and Conversation." In *Liars and Heaps*, ed. J. C. Beall, 39–72. Oxford/New York: Oxford University Press.

- . 2006. *Vagueness in Context*. Oxford: Oxford University Press.
- Slater, H. 1989. "Consistent Vagueness." *Noûs* 23: 241–52.
- Sorensen, R. 1988. *Blindspots*. Oxford: Oxford University Press.
- . 2001. *Vagueness and Contradiction*. Oxford: Oxford University Press.
- . 2005a. "Précis of *Vagueness and Contradiction*." *Philosophy and Phenomenological Research* 71: 678–85.
- . 2005b. "A Reply to Critics." *Philosophy and Phenomenological Research* 71: 712–28.
- Strawson, P. F. 1952. *Introduction to Logical Theory*. London: Methuen.
- Tarski, A. 1944. "The Semantic Conception of Truth and the Foundations of Semantics." *Philosophy and Phenomenological Research*, 4: 341–76.
- Thomason, R. 1970. "Indeterminist Time and Truth-value Gaps." *Theoria* 3: 264–81.
- Unger, P. 1980. "The Problem of the Many." *Midwest Studies in Philosophy* 5: 411–67.
- van Fraassen, B. C. 1966. "Singular terms, Truth-value gaps, and Free Logic." *Journal of Philosophy* 63: 481–95.
- . 1968. "Presupposition, Implication, and Self-Reference." *Journal of Philosophy* 64: 136–52.
- Williamson, T. 1990. *Identity and Discrimination*. Oxford: Blackwell.
- . 1994. *Vagueness*. London: Routledge.
- . 1995. "Definiteness and Knowability." *Southern Journal of Philosophy* 33 (Supplement): 171–91.
- . 1996. "Wright on the Epistemic Conception of Vagueness." *Analysis* 56: 39–45.
- . 1997. "Imagination, Stipulation, and Vagueness." *Philosophical Issues* 8: 215–28.
- . 1999. "On the Structure of Higher-Order Vagueness." *Mind* 108: 127–43.
- . 2000. *Knowledge and its Limits*. Oxford/New York: Oxford University Press.
- . 2005. "Vagueness in Reality." In *The Oxford Handbook of Metaphysics*, ed. M. Loux and D. Zimmerman, 690–715. Oxford: Oxford University Press.
- Wright, C. 1987. "Further Reflections on the Sorites Paradox." *Philosophical Topics* 15: 227–90.
- . 1995. "The Epistemic Conception of Vagueness." *Southern Journal of Philosophy* 33 (Suppl.): 133–59.
- . 2001. "On Being in a Quandary." *Mind* 110: 45–98.
- . 2003. "Vagueness; A Fifth Column Approach." In *Liars and Heaps*, ed. J. C. Beall, 84–105. Oxford/New York: Oxford University Press.