

Ontic vagueness and metaphysical indeterminacy

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The chair I am sitting on *definitely* weighs more than one gram. But it *definitely does not* weigh more than a ton. Not all classifications of this chair are so easy. It is, for example, a funny bluey-green colour. So is it blue? It seems neither definitely blue, nor definitely not blue.

Perhaps in this case, our usage of ‘blue’ does not fix perfectly sharp truth-conditions for the word. Or, more radically, maybe there is a fact of the matter about whether my chair is blue, but despite knowing its exact shade I don’t know whether it’s blue. But some philosophers think that there are cases of indefiniteness of a *metaphysical* sort: cases where, independently of how we know or represent the world, there’s no determinate way that the world *itself* is.

In what sorts of cases might we think there is this sort of metaphysical indeterminacy (‘m-indeterminacy’)? What is it for a given case of indefiniteness to be ‘metaphysical’, or for there to be ‘no determinate way that the world is’? How might the logic work? Are there reasons for postulating this distinctive sort of indefiniteness? Conversely, are there reasons for *denying* that there is indefiniteness of this sort? This survey will tackle each of these questions in turn.¹

1 What sorts of friends of m-indeterminacy might there be?

There are various arenas in which appeal to m-indeterminacy has some intuitive appeal. If you are inclined to object to classifying the cases below as examples of m-indeterminacy rather than some other form of indefiniteness, hold fire—I turn to alternative diagnoses presently.

The metaphysician of ordinary objects Take the mountain Kilimanjaro. Surely there are things

¹A note on terminology: ‘Indefiniteness’ is used for a generic, pre-theoretic notion. I use special purpose terminology (e.g. ‘metaphysical indeterminacy’ ‘semantic indeterminacy’ ‘epistemic indefiniteness’) as placeholders for particular theoretical accounts of the nature of indefiniteness. The switch between ‘indefiniteness’ and ‘indeterminacy’ has little significance, though I will tend not to use ‘indeterminacy’ to cover cases of epistemic indefiniteness.

that are neither definitely part of Kilimanjaro nor definitely not parts—pebbles half embedded on its slopes, lumps of bedrock around its base, etc. What things are *parts* of Kilimanjaro (or: what things *constitute* it) seems indefinite.² Indefiniteness in parthood/constitution of ordinary objects like Kilimanjaro is our first candidate for m-indeterminacy. Likewise, the spatial *location* of Kilimanjaro seems indefinite, and as with the vague parts, might be put forward as an example of m-indeterminacy.

More contentiously, suppose one believes that there exists a multitude of mountain-like though precise agglomerations of rock in the vicinity of Kilimanjaro. Then one might think, first, that there is no fact of the matter about which one of the precise agglomerations of rock is identical with Kilimanjaro; and second, that this indefiniteness is a metaphysical matter. If so, one finds in ordinary objects not only m-indeterminacy of parthood and spatial boundaries, but also m-indeterminacy of identity.³

The personal identity theorist Plausibly, it is indefinite exactly when I come into existence, and exactly when I cease to be. Perhaps this is an instance of indefiniteness that is metaphysical in its source.

Outlandish cases in the literature also lend themselves to this description. Consider the following case. My brain and body is damaged rather badly in a car accident, as is that of my twin. A crazed scientist sees that the areas of the brains that are damaged in each case are different, and that by stitching together compensating bits of the bodies, he can rescue a single living organism. This contains many of my body parts, many of those of my twin. It has some of my memories, and some of those of my twin. Likewise personality traits have been shared. Plausibly, it is indefinite whether I have survived the experience, and continue to persist as the stitched-together individual. Maybe here the facts about my

²For composition theories of ordinary objects, see Sider (2001). For constitution theories of ordinary objects, see Wiggins (1968).

³See Tye (1990) for discussion of the vagueness of ordinary objects. Tye argues that vague objects do not commit one to vague identities. The main focus of Heller (1996) is on arguing against a metaphysical construal of this kind of vagueness. McKinnon (2003) argues that there can be objects which have metaphysically vague locations without having metaphysically vague parts. For a survey of alternative accounts of these phenomena, see Weatherson (2004). One way of arguing that there must be some metaphysical indeterminacy in the location an ordinary object (such as myself) is to start from the assumption that there is something which is *definitely* identical to Kilimanjaro—for then we close off theories that would locate the indefiniteness in the relation between Kilimanjaro and various precise Kilimanjaro candidates. See Smith (2007) for related discussion.

persistence are m-indeterminate.⁴

The mereologist Common sense tells us that sometimes, little things make up bigger things.

My arms, kidneys, skin, bones and so forth, make up or ‘compose’ my body. Common sense (it is alleged) also tells us that sometimes little things do not compose any further thing; that there is no ‘scattered object’ composed from my toes, the back half of Dobbin the donkey and the Eiffel tower. We ask the question: under what circumstances do some (little) things compose some further (bigger) thing?

Some answers to this question respect common sense at least to the extent of accepting the existence of my body and denying the existence of scattered entities. But, plausibly, common sense prescribes no *definite* boundary between things ‘integrated enough’ to compose something, and those ‘too scattered’ to do so.

Take a borderline case: some moment in the decay of a body, for example, at which it seems indefinite whether the parts that remain compose a further thing. The suggestion is that here we have a case where it is indefinite whether the further thing exists—and that this is an instance of m-indeterminacy.⁵

The philosopher of physics Quantum phenomena have been suggested as a locus of metaphysical indeterminacy. The debate focuses on two issues. The first is to do with the vexed question of the nature of quantum particles. Very roughly, discussion centres on a situation where an electron is absorbed by an atom, becoming entangled with an electron in its outer shell. Later, one of the entangled electrons is emitted. In such a scenario, is there a fact of the matter about the identity of the particles absorbed and emitted? Some argue not.

⁴For illustrative discussion of m-indeterminacy and creation and destruction, see van Inwagen (1990, chs.17-18). For a survey of alternative responses to these sorts of phenomena, see Sider (2001).

⁵The *locus classicus* for this debate is van Inwagen (1990), who calls this the ‘special composition question’. Van Inwagen himself gives an illustrative discussion of a ‘restricted answer’ to the question that is explicitly committed to m-indeterminacy.

Note that we focus here on cases of indefinite *composition*. Another candidate for mereological m-indeterminacy would be m-indeterminacy in part-hood, mentioned briefly in an earlier section. *Prima facie* these are independent; it might be m-indeterminate whether something composes, while perfectly determinate what parts it has if it exists. Moreover, even if it m-indeterminate whether *x* is part of *y*, there need be no objects such that it is m-indeterminate whether they compose anything (for the latter, see Barnes and Williams (MS), where it is argued that m-indeterminate parts are compatible with universal composition).

The second way of connecting m-indeterminacy and quantum mechanics focuses on the status of properties of quantum systems. If a particle is in a superposition of spin-up and spin-down, then one natural description is that it is *neither definitely spin-up nor definitely spin-down*. The sort of indefiniteness involved might be thought to be distinctively metaphysical in nature (thinking of the indefiniteness involved as mere ignorance of precise states of affairs is notoriously problematic).⁶

The philosopher of mathematics A key foundational result in the mathematics of sets is that certain very natural statements are not settled on the basis of the standard axiom systems. In particular it is in a strong sense independent of the standard ZFC-axiomatization whether certain ‘large cardinals’ exist—for example, whether there is a first inaccessible cardinal.⁷ At least since Zermelo (1930), philosophers have suggested that in some sense it might be *indefinite* how ‘large’ the hierarchy of ZFC-sets gets, even when we *insist* that our quantifiers be interpreted to be talking about *absolutely everything whatsoever*. And one natural reading of what is being suggested here is that it is m-indeterminate what sets there are.⁸

The metaphysician of time Will there be a sea battle tomorrow? It is compatible with the ways things are now that there will be, and compatible with the way things are now that there won’t be (even granted the complete current state of the world, and all the laws of nature). The future seems “open”. Perhaps one should express this by saying: It is

⁶For the discussion of the identity of quantum particles, see Lowe (1994) and subsequently French and Krause (1995); Noonan (1995); Lowe (1997); Hawley (1998); Lowe (1999).

The second question, in particular, raises foundational issues around quantum mechanics. For an accessible introduction to quantum mechanics and its philosophical interpretations, see Albert (1994). The Bohmian interpretation illustrates the interpretative issues here: Bohm’s interpretation attributes perfectly determinate properties to particles at all times, and there seems little room for m-indeterminacy to enter. So one cannot expect a case for worldly indeterminacy from quantum mechanics to be interpretation-neutral. Nor is it *obvious* where indeterminacy enters the official theory (as opposed to motivating glosses) on other popular interpretations such as GRW.

⁷It is not the simple application of the general phenomenon of incompleteness. Arguably, second-order formulations of Peano Arithmetic, though syntactically incomplete, are ‘categorical’; all models are isomorphic to one another, and so agree on the truth-values assigned to each sentence. Second order formulations of ZFC are by contrast only quasi-categorical; two models will be such that one is isomorphic to an ‘initial segment’ of the other. Some have argued that with the addition of a certain axiom, and by construing set-theoretic quantifiers as ‘logically unrestricted’, one can get a categorical extension of ZFC[U] (ZFC with quantifiers ranging not only over sets, but over absolutely everything). See McGee (1997) for this view, and the postscript to Field (1998) for opposition.

⁸For discussion of the coherence of quantifying over all things (or all sets) see the papers collected in Rayo and Uzquiano (2006). There are of course, multiple alternative accounts of the perplexing phenomenon here, which is intimately related to the so-called ‘indefinite extensibility’ of set theory. See Shapiro and Wright (2006).

indefinite whether there will be a sea-battle tomorrow. But those believing in the open future usually think of this openness as a distinctively metaphysical matter (not a matter of mere ignorance of future facts, for example). The believer in the open future seems to believe in far-reaching m-indeterminacy.⁹

Friends of m-indeterminacy can be expected a varied bunch, each with their own area-specific reasons for believing in it. In each area, foes of m-indeterminacy may admit there is indefiniteness, and yet argue that nothing deserving the name ‘m-indeterminacy’ needs to be invoked in explaining what is going on. The literature on *alternative, non-metaphysical* treatments of indefiniteness is enormous, but views of two general types are particularly prominent:

The semantic view.¹⁰

Paradigmatically, this view takes the source of indefiniteness to be in shortcomings in the meanings that are assigned to certain words. Consider my chair—it seems that in one sense all the *fundamental facts* about the colour of the chair are perfectly determinate—it is, we may suppose, of a specific shade, hue and saturation. But the meaning of ‘blue’, even together with these facts, does not suffice to make the sentence ‘that chair is blue’ true or false. The semantic rules for ‘blue’ simply do not ‘cater’ for certain kinds of precisely describable situations.

The epistemic view.¹¹

Many philosophers will agree that whatever else is true of indefiniteness, if it is indefinite whether p , one does not know that p , nor know that not- p .¹² The *epistemicist* will identify indefiniteness with this lack of knowledge—and typically will believe there to be sharp, but unknowable boundaries to the application of vague and indefinite terms. In some cases, the view that indefiniteness is a species of ignorance is hard to swallow—can there really be a fact of the matter (albeit unknown) as to the exact nanometre wavelength that turns blue light into

⁹For an illustrative discussion of the open future, see Belnap and Green (1994).

¹⁰See for example Lewis (1993), Fine (1975), Keefe (2000).

¹¹Williamson (1994) develops epistemicism as a treatment of vagueness with a particular eye to the sorites paradox. His treatment involves a specific account of what *kind* of ignorance makes for vagueness, in terms of the ‘semantic plasticity’ of paradigmatically vague words. The indefiniteness of the future would presumably not be vague in this sense.

¹²See Greenough (2003) for the suggestion that lack of knowledge be used as a minimal characterization of indefiniteness. See Dorr (2003) for arguments against the incompatibility of indefiniteness and knowledge.

non-blue light? In other cases, an epistemic response is more attractive; it is a familiar thought that the seeming indefiniteness of the future might simply be a result of our in-principle lack of knowledge of future facts.

Several points should be emphasized. First, these are each *glosses* covering a whole class of accounts of indefiniteness; specific theories tidy up these guiding thoughts into tightly formulated theses. Second, thinking of the debate over indefiniteness as shaped by the trichotomy of semantic, epistemic, and metaphysical approaches, though common, may be misleading. No argument has been given that these three options are *exhaustive*.¹³ Nor have I given any argument that the list is *exclusive*; for all I have said a given case of indefiniteness might feature both semantic and metaphysical indeterminacy.¹⁴ The *scope* of each theory is also yet to be spelled out. Many familiar semantic and epistemic theorists present their theory as *imperialistic*, i.e. putatively covering every instance of indefiniteness.¹⁵ But theorists might be more pluralistic than this, taking indefiniteness to be realized by different kinds of phenomena in different cases. (In fact, I think the friend of m-indeterminacy should be non-imperialist: see in particular the section on Evans' argument below).

2 What is metaphysical indeterminacy?

What are we looking for when we ask what m-indeterminacy is? The friend of metaphysical indeterminacy can already offer a kind of 'ostensive' characterization by citing their favoured paradigms and counter-paradigms (of course, they may differ among themselves over what the paradigms are). One might also wish to know how the notion works: what first-order

¹³It is hard to fit the psychological accounts of indefiniteness of Wright (2003) and Field (2003) into any of the above categories. Likewise, a view whereby the source of indeterminacy is in the representational properties of *beliefs* or indeed maps or pictures, though obviously related to the semantic account, does not strictly fall under it.

¹⁴Some have argued that semantic indeterminacy implicitly presupposes metaphysical forms of indefiniteness, for example, concerning which representational properties a given word possesses. See Merricks (2001). This is discussed further below. Others have argued that cases of m-indeterminacy can be expected to give rise to forms of semantic indeterminacy, for example, if it is metaphysically indeterminate what object is in a certain location, it will be indefinite what referent a name introduced by pointing to that location has. See, for example, Williams (2008).

¹⁵This seems to be a common aspect of the projects of Williamson (1994) and Keefe (2000), for example. Eklund (forthcoming) makes the assumption explicit in arguing against 'ontic' vagueness.

theories invoking m-indeterminacy are consistent, and what claims follow from what others. This question, of the logic of m-indeterminacy, I shall put off till a later section.

Setting those aside, there remain several possible readings of the question *what is metaphysical indeterminacy?* One is as a request for terminological clarification: how is the term ‘m-indeterminacy’ to be used, and how does it relate to other philosophical terms of art in the vicinity? Another is as a request for substantial theory: for example, for some kind of metaphysical account of the nature of this putative phenomenon. I deal with each in turn.

2.1 Terminology

Many different phrases are used: metaphysical indeterminacy, metaphysical vagueness, ontic vagueness, and *de re* vagueness. There are distinctions one might wish to draw between these various notions. Drawing on the literature, I set out a set of distinctions the terminology can be used to track. A caveat: it isn’t clear that there are any firm conventions in this regard, so what follows will be to some extent stipulative.

Vagueness vs. Indeterminacy

Sometimes “metaphysical indeterminacy” and “ontic vagueness” are used interchangeably. But this is doubly tendentious. Vagueness (at least as used as a term of art within philosophy) is often associated with the sorites paradox,¹⁶ or at least with *higher order* indefiniteness.¹⁷ But the sorts of indefiniteness that interest the friend of m-indeterminacy might not have these features. It is not clear, for example, whether the believer in the open future, or in m-indeterminate survival, has any motivation to think that sometimes it will be m-indeterminate whether some *p* is m-indeterminate. For this reason, it would not be unreasonable for someone to restrict the term ‘vagueness’ to sorites-susceptible phenomena. It would be a substantive question whether there is metaphysical *vagueness* in addition to metaphysical *indeterminacy*.¹⁸

¹⁶Example: A single grain of sand is not a heap; adding one grain of sand to a non-heap doesn’t make a heap; so (absurdly!) no number of grains of sand make a heap.

¹⁷That is, there being cases where it is not definite whether or not something is definitely the case.

¹⁸See Eklund (forthcoming) for an example of this distinction in action. See Heller (1996) for an argument against metaphysical vagueness that seems to rely crucially on more than mere indeterminacy being at issue. Hudson (2001, ch.3) discusses Heller’s argument.

Metaphysical vs. Ontic

Secondly, one might wish to draw a distinction between *metaphysical* questions and *ontic* questions. One might use the latter to indicate only questions belonging to *ontology*: the study of what there is. If so, perhaps only metaphysical indeterminacy or vagueness that turns on issues of *existence* or *identity* would count as properly ontic.¹⁹ We might have metaphysical indeterminacy without ontic indeterminacy in this narrow sense. Among our motivating examples were putative m-indeterminacy concerning the open future, or what properties a thing has, or what location a thing is at; it is not so clear that these are paradigmatically *ontic*.

Vague objects?

Connectedly, one often finds ‘ontic vagueness’ associated with the claim that there are ‘vague objects’ and/or ‘vague properties’.²⁰ Now some friends of m-indeterminacy (particularly those interested in the metaphysics of ordinary objects) are interested in the vagueness characteristic of what one might call ‘vague objects’: Kilimanjaro, say. But: (i) a brief glance at our introductory survey shows that not every candidate arena for m-indeterminacy is connected with such paradigmatically ‘vague objects’—the open future, for example. So it’s wrong to take m-indeterminacy as *obviously* concerned with vague objects. (ii) A natural approach to theorizing about the ‘vague object’ Kilimanjaro is to analyze its vagueness in terms of it being m-indeterminate what its parts are, or what its location is, and the like (cf. Tye, 1994a). So, plausibly, one should analyze the notion of vague objects in terms of m-indeterminacy, rather than vice versa. (iii) Even if one is not a friend of m-indeterminacy, one might still want to make sense of the commonsensical claim that Kilimanjaro is a vague object. And, drawing on the above, there are obvious epistemic and semantic readings of Kilimanjaro’s having indefinite parts, or indefinite location, or it being indefinite which object it is identical to.²¹

¹⁹For example, Hudson (2005, p.11): “ontological vagueness ... that is to say ... non-epistemic, non-linguistic indeterminateness with respect to existence and identity.”

²⁰See for example the introductory remarks in Keefe and Smith (1997, introduction), Heller (1996), Sorensen (1997, §7), McKinnon (2003), Rosen and Smith (2004). Eklund (forthcoming) §I is representative when he characterizes the believer in ontic vagueness as holding: “(sometimes) if a singular term is vague, then it refers to an object that is itself vague.”

²¹A natural move is to formulate the criterion for something’s being a vague object in *de re* terms: is there some object identical to Kilimanjaro, such that it is indefinite where *it* is located, or what parts *it* has, etc. This raises new questions; but note that it is not so pre-theoretically obvious that there are vague objects in this *de re* sense. For more on the connection between m-indeterminacy and *de re* indefiniteness, see below.

Sometimes discussion of m-indeterminacy seems to presuppose a central role for vague objects: to assume that when one claims that it is m-indeterminate whether a is F , one must somehow ‘blame the vagueness’ either on the object a or the property P involved. I do not see why one is forced to say any such thing, any more than one must ‘blame’ metaphysical contingency either on an object (me) or a property (sitting down) in light of the metaphysical contingency of the fact that I am sitting.²²

Indefiniteness *de re*?

Sometimes the discussion of vagueness/indeterminacy in reality is expressed in terms of vagueness and indeterminacy *de re*. A natural reading of this phrase directs us to evaluate such claims as: there is some object x and some property X , such that it is indefinite whether x instantiates X .²³ It is contentious to think that all cases of m-indeterminacy can be presented in that syntactic form. Some paradigmatic candidates for metaphysical indeterminacy seem hard to force into that shape: an example is the claim that it is m-indeterminate whether there exist (unrestrictedly) exactly three things.²⁴

Thus it’s far from obvious that instances of m-indeterminacy require an accompanying *de re* truths. One might still hold that certain *de re* indefiniteness claims can only hold if the indefiniteness involved is m-indeterminacy; but such a thesis would need careful formulation and argument. Consider the *de re* claim that there is an object such that it is indefinite whether it is a mountain. Why shouldn’t that be true under a semantic or epistemic reading of the operator involved?²⁵ The *de re* conception of ‘vagueness in reality’ seems to cross-cut the m-indeterminacy conception; I shall not be discussing it further.

²²See Hawley (2002) and Williamson (2003b, §7) for discussion articulating similar misgivings about the focus in some of the literature on ‘vague objects’.

²³Williamson (2003b) and Sainsbury (1989) concentrate on such *de re* formulations as the marker of vagueness in reality. *De re* formulations are also often used in introductory glosses—see Merricks (2001), for example. Notice that this *de re* claim doesn’t immediately follow from de dicto claims such as ‘it is indefinite whether Billy instantiates Baldness’. The *de re* claim $\exists x \neg D[Fx]$ no more follows automatically from $\neg D[Fa]$ than $\exists x \neg \Box[Fx]$ follows automatically from $\neg \Box[Fa]$ (famously, ‘it is not necessary that the number of the planets = nine’; there is some thing such that it is not necessary that it = nine’.

²⁴See Hawley (2002) for discussion of *de dicto* and *de re* characterizations of metaphysically vague existence. See also Williamson (2003b), who suggests that we use wide scope propositional quantifiers to capture the general form of metaphysically vague states of affairs.

²⁵See Williamson (1994, ch.9) for discussion of such cases from an epistemicist perspective and Williamson (2003b) for a general discussion of the formulation of a criterion for vagueness in reality in *de re* terms and how this interacts with various logico-semantic frameworks.

2.2 Analysis and Definitions

When we ask ‘What is metaphysical indeterminacy’ it might be we’re looking for *conceptual analysis*: some formulation in independently understood terms of the meaning of ‘metaphysical indeterminacy’. Or it might be we’re looking for *metaphysical analysis*: some substantive story or ‘real definition’ of *what it is* for p to be m-indeterminate. It might be that we’re looking for a characterization of the phenomenon that may fall short of analysis: some informative claim of the form: p is m-indeterminate iff $F(p)$.²⁶

The search for analysis (metaphysical or conceptual) or necessary and sufficient conditions of a philosophically controversial notion such as m-indeterminacy is understandable.²⁷ But there are reasons not to put too much emphasis on these questions. First, to some of these questions there may not *be* any answers: why think that such philosophical concepts have any illuminating conceptual analysis, or independent characterization? Second, even where one finds an answer, it might be less revelatory than one hopes. One metaphysical position would hold that m-indeterminacy is metaphysically irreducible, susceptible to no further analysis.²⁸ Third, it is possible to understand a notion perfectly well—even a philosophical term of art—without being in a position to answer any of the questions above. I take myself to understand the notion of *metaphysical possibility*, but I do not think that understanding rests on the various highly contentious metaphysical accounts of modality on the market, and I certainly would not be in a position to offer a theory-neutral definition of the concept. So addressing the above questions, while interesting, is not a *precondition* of engaging in first-ordering theorizing. It seems to me sufficient as a starting point that one can offer various glosses on the notion, that one can cite various paradigms and counter-paradigms, and that one knows how to reason with

²⁶See Sainsbury (1994). This issue of the *exhaustiveness* and *exclusiveness* of the metaphysical/epistemic/semantic trichotomy is clearly an issue here. If some such exhaustive trichotomy is correct, it is tempting to try to characterize m-indeterminacy negatively, by appeal to a generic notion of indefiniteness. If they are not *exclusive*, then the most straightforward negative characterization (an instance of indefiniteness that does not feature semantic or epistemic indefiniteness) will not work. For a definition of m-indeterminacy sensitive to such issues, see Barnes (MSa, 2006, ch.1).

²⁷See Greenough (2003) and Smith (2005b) for defences of a methodology for seeking ‘definitions’ of indefiniteness phenomena prior to building the theory. The authors differ over how ‘theory-neutral’ the definition should aim to be.

²⁸In the terminology of Lewis (1983), as recently extended by Sider (2007), this would be to treat *it is metaphysically indeterminate whether* as a perfectly natural or fundamental operator. Compare Barnett (forthcoming), who defends a primitivism about the operator ‘it is vague whether’. Interpreted metaphysically and not merely conceptually, this is close to the position suggested here. More expansive suggestions include Akiba’s (2004) account of m-indeterminacy in terms of a quasi-temporal ‘precisificational’ dimension of reality.

the notion—but the friend of m-indeterminacy can do *all that*.

3 The logic of metaphysical indeterminacy

To formulate and compare m-indeterminacy-invoking theories against their rivals, one needs minimally to know which theories are *consistent*. To evaluate objections against m-indeterminacy one needs to know what claims follow from what others. Even if we can set to one side calls for grand theories of the nature of m-indeterminacy, we cannot evade calls for a modest theories of m-indeterminacy—an account of the *logic* that governs the operator.²⁹

In this section we briefly consider two approaches. On the first, indeterminacy is understood in terms of a third value sentences may have, distinct from truth and falsity—to say that a given claim is indeterminate is to say it has this third value. The other approach is the result of enriching classical (two-valued) logic with a sentential operator: “it is determinately the case that”. It is natural to model the logic of this operator on familiar sentential modal logics. Questions then arise both about what the intended interpretation of this operator is, and which modal logical principles it obeys.

The most common modest theory of metaphysical indeterminacy is built around a non-classical 3-valued logic.³⁰ When propositions correspond to the facts, they are true. When they don’t, they are false. That leaves the third case: the middle-value of the 3-valued system. To say that something is metaphysically indeterminate, it might be proposed, is to say that the proposition expressing it has the middle-value.³¹ The three-valued systems handle this inflation

²⁹Tye (1994b) describes epistemic theories of vagueness as a “shift to the right” endorsed by “conservatives”; and metaphysical vagueness as a “shift to the left” to embrace “the liberal chic of alternative logics”. Sociologically, this has some truth to it: non-standard logics have often been associated with metaphysical vagueness. But as we shall see, the conservative tendency is also alive and well as an account of metaphysical indeterminacy.

³⁰Cf. Tye (1994a, 1990), Parsons and Woodruff (1997). Rosen and Smith (2004) suppose that any fuzzy theory automatically involves metaphysical vagueness, in the sense of assigning vague properties to predicates (they go on to describe a sense in which it might also contain fuzzy objects). I do not myself see why the association of a semantic value that divides the domain into three or infinitely many segments rather than just two should be thought to be a particularly metaphysical matter—in a perfectly determinate world, it might simply reflect the fact that our talk is best modelled in a certain way (in the same spirit that third truth values might help model presupposition failure). This is another reason why, in my view, focus on indefinite objects or properties rather than m-indeterminacy itself is unhelpful. Compare also Williamson (2003a, SS6,7)

³¹This is the most obvious interpretation of a three-valued system, on which ‘it is indeterminate whether’ is treated as a extensional operator. $\nabla(p)$ is then true whenever p takes the third value; and is false whenever p is true or false. This isn’t the only way to interpret a three-valued framework. See Field (2003), who argues for a three valued logic combined with a fully disquotational truth-predicate, and the suggestion that the determinacy operator be defined in the course of introducing into the logic a particular conditional device that supports standard

of truth-values in a very natural way: by increasing the number of options available on the truth-tables. For example, as well as saying what the value of a $\neg p$ is to be when p is true, and when p is false, we have to also say what it is to be when p has the third value. Given natural choices of truth-tables, we get a revisionary logic, in the sense that some ‘classical logical truths’ can no longer be assumed true. Suppose it were indeterminate whether *Harry has survived this massive psychological shift*. Classically, the law of excluded middle tells us that *either* Harry survives or he doesn’t; the alternative logicians will urge that the relevant instance of the law of excluded middle will be indeterminate rather than true.³²

The flip-side of this liberal way with the verities of standard logic is a series of puzzling cases. Consider again the case where it is indeterminate whether Harry survives some episode, and call the proposition that Harry survives P . P gets the third truth-value. Standardly, $\neg P$ will get the same status as P , as will $P \wedge P$. If both these are accepted, then every ‘truth functional’ system will have to say that $P \wedge \neg P$ has the same, indeterminate status.³³ But this is an explicit contradiction! Defenders of the three-valued logics have a range of options here: they might attempt to placate their opponents by pointing out that contradictions can never, at least, be fully true. But it is the *parity* between borderline cases, where we feel conflicted over the status of the claim, and explicit contradictions, where we happily reject the claims, that is so repugnant to many.

Many familiar forms of reasoning are brought into question by such logics. The revisionary norms for reasoning that ensue give wriggle room against otherwise tricky arguments. But they also mean that much of what we take for granted (not least, in reasoning about metaphysical indeterminacy) is shaken. Quite apart from any counterintuitiveness of the proposals, defenders of this view owe an account of the empirical success of scientific theories framed in terms of reasoning.

³²This minimal sense of revisionism can be established without having to engage with the vexed question of what it is for an argument to be valid, within a three value system. Many-valued systems have been explored in great technical detail. A recent introduction to this material can be found in Beall and van Fraassen (2003).

Some theorists would multiply the truth values still further and introduce infinitely many *degrees of truth* (so called ‘fuzzy logic’). See van Inwagen (1990), Williamson (2003b), Smith (2005b). Many find this appealing in the context of modelling sorites-prone *vagueness*.

³³To see this result, think about the truth tables for conjunction. Truth tables tell you what value a conjunction gets appealing only to the truth-values of its conjuncts (that is what it means to say that these systems are ‘truth-functional’). That means we can substitute one conjunct for another with the same truth value, and be guaranteed to get the same overall value for the conjunction. But we’ve said that P and $\neg P$ have the same value, so we should be able to switch the latter for the former in one conjunct of $P \wedge P$, to obtain $P \wedge \neg P$. If $P \wedge P$ is indeterminate, so is the latter.

the classical framework they recommend revising.

To reject alternative logics is not, however, to reject metaphysical vagueness. Instead, one can follow recent defenders of an approach that aims to integrate an account of metaphysical indeterminacy as smoothly as possible with standard, classical ways of thinking and reasoning. Akiba (2000, 2004), Barnes (MSa, 2006, ch.1, appendix) and Williams (forthcoming) suggest (closely related) theories of this form.³⁴

The key here is to focus attention on the determinacy operator itself. Consider again borderline Harry, and the instance of law of excluded middle that seems initially problematic: either Harry survives or he doesn't. The classical tendency accepts this; there are only two options for Harry. Nevertheless, it may be metaphysically indeterminate *which* of these two options obtains. Indeterminacy, on this account, is not some third status that rivals surviving or failing to survive, but rather an unsettledness between the two polar options. On this view, the disjunction itself is determinate; it is only the disjuncts taken separately that are indeterminate.³⁵ The project is to systematically extend this basic idea to lay out a logic for determinacy as a sentential operator.

Suppose that there are a range of perfectly precise ways for reality to be, and suppose reality itself is indeterminate. For simplicity, suppose that there are just two ways, differing in that the first (w_1) says that p , the second (w_2) says that $\neg p$. Following the line suggested above, however, it may be that in reality it is determinate that $p \vee \neg p$ but indeterminate which disjunct holds. If all else is equal, then it seems to follow (i) that determinately, either w_1 or w_2 represent reality right; but (ii) it is indeterminate whether w_1 represents reality aright, and indeterminate whether w_2 represents reality aright.

Call a way for reality to be that doesn't determinately misrepresent it an 'ontic precisification' of the world (cf. Akiba (2000)). To get a general characterization of the determinacy operator, we say that "Determinately p " holds iff every ontic precisification represents that p .

³⁴The direct inspiration for these theories is the *supervaluational* theories often put forward as a theory of semantic indeterminacy. A classic discussion of supervaluationism see Fine (1975). See Williamson (1994, ch.5) for critical discussion and Keefe (2000, *passim*) for a defence of it as a semantic theory of vagueness. Well-known treatments of the open future also have strong analogies to supervaluationism. See Belnap and Green (1994). An extension of this approach to give a modest theory of degrees of determinacy (with a formal system analogous to Lewis (1970); Kamp (1975); Edgington (1997)) should also be possible via the same route.

³⁵This is reminiscent of supervaluationism. See Keefe (2000). On the other hand, the related claim that the disjunction is *true* whereas each disjunct is *untrue* is not something this theory is obviously committed to: see below.

Notice that since every ontic precisification is represents some fully classical state of affairs, all the tautologies of classical logic will be true at each one; and that means that each classical tautology will be a determinate truth.

The various theories then differ amongst themselves about exactly how to conceive of these ontic precisifications,³⁶ and how exactly to fill out the details of the semantics.³⁷ There is room also for disagreement about what logical principles govern the operator itself.³⁸ But the common core already ensures that classical logical truths will be retained.

4 Why believe there is metaphysical indeterminacy?

We have considered potential paradigms of m-indeterminacy, clarified the terminology and described a variety of logical settings. I now turn to the issue of why one should believe in m-indeterminacy in the first place. One's reasons for believing in m-indeterminacy might be *direct* or *indirect*. A direct reason would be that a theory of the relevant cases—be the topic time, personal identity, or whatever—that embeds *metaphysical* indeterminacy as opposed to some other kind of indefiniteness, is overall a better theory of that particular topic. The particular reasons vary from case to case. The sort of reasons to believe in a *metaphysically* open future, as opposed to merely *epistemically* open (considerations to do with free action, fatalism and the like) are unlikely to be replicated in a discussion of quantum indeterminacy. I have no space

³⁶Akiba (2004) offering a substantive (and perhaps hard to swallow) metaphysical construal, whereby the precisifications are slices along a quasi-spatial 'precisificational dimension' of reality. Barnes (MSa), Barnes (2006, ch.1) and Williams (2008) offer a more metaphysically lightweight construal. They do not attempt to *eliminate* appeal to m-indeterminacy, but simply to use a framework of ersatz possible worlds representing precise ways for the world to be, to give a semantic representation of the logic of that operator. An ersatz world w will count as an 'ontic precisification' just in case it is not m-determinate that the actual world isn't how w describes it.

³⁷Williams (2008) takes over the supervaluationist analogy wholesale, having indeterminate claims being neither true nor false. Certain aspects of the literature on supervaluationism will therefore transfer over, including the alleged failures of classical principles such as conditional proof and reductio. See Williamson (1994, ch.5.) for the worries and Williams (forthcoming) for a response. Barnes (op cit) argues that m-indeterminacy, handled as above is compatible with a fully classical, bivalent semantics (compare the semantic account of indefiniteness favoured by McGee and McLaughlin (1994)). Just as $p \vee \neg p$ is compatible with p being indeterminate, Barnes urges that $T(p) \vee F(p)$ is compatible with p being indeterminate. The logic associated is entirely classical. Williamson (1994), objects to the McGee-McLaughlin's version of this proposal, by arguing that there would no longer be a clear sense in which they were offering a *semantic* account of vagueness. Barnes can gladly agree—though of course will disagree with Williamson's further suggestion that the view collapses into an epistemic one.

³⁸It is natural to assume that the above conception leads to a normal modal logic. In particular principles like $D(A \supset B) \supset (DA \supset DB)$ and the analogue of the necessitation rule (from $\models A$, infer $\models DA$) should hold, as well as the T -principle $DA \supset A$. Whether the analogues of other modal principles such as B , $S4$ and $S5$ hold is then an open question, and nothing in the motivating ideas described above settles this.

to do justice to the great range of local discussions here—to do so would require setting out the rival philosophical accounts of each area. However one recent style of argument is worth independent attention, and I sketch it below.

A more indirect reason for believing in m-indeterminacy would be if one believes that m-indeterminacy is a *implicit commitment* of other kinds of indefiniteness. Trenton Merricks has argued for something close to this, and I finish this section by briefly sketching his ideas.

4.1 Diagnostic claims

In recent work, Sider (2001) (drawing on earlier work by David Lewis) argues that various leading theories of indefiniteness will have difficulty explaining how certain specific statements could ever be indefinite. One example are finite counting claims, such as ‘there exist exactly n things’. If a metaphysical theory entails that such claims are indefinite, and if Sider is right that there is no tenable semantic, epistemic, or other account of the indefiniteness, then we have reason (by elimination of alternatives) to take that metaphysical theory to be committed to m-indeterminacy.³⁹

Of course, if you had reason to think m-indeterminacy impossible or highly undesirable, you could at this point argue by modus tollens that the theory one starts with must be wrong. (That, in fact, is exactly the argumentative strategy favoured by Lewis and Sider.) But of course, at this point the argumentative situation is familiar; we have to weigh up the virtues and vices of theories that avoid all indefiniteness (which are themselves fairly radical) compared to m-indeterminacy involving theories.

One much discussed example concerns van Inwagen’s ‘special composition question’: When do some things compose a further thing?⁴⁰ For illustrative purposes, consider van Inwagen’s answer: that things compose iff they form a living thing; and suppose that the only simple things

³⁹This of course supposes that the reasons against semantic etc theories don’t generalize to be objections to m-indeterminateness in counting claims.

⁴⁰See in particular Lewis (1986, p.212ff) and Sider (2001, §4.9). An excellent starting point to the debate is Sider (2001, §4.9) and the ensuing symposium in *Philosophy and Phenomenological Research* comprising Sider (2004), Gallois (2004), Hirsch (2004), Markosian (2004). Smith (2005a) gives a careful and rigorous degree-theoretic treatment of indefiniteness involved. Sider carefully sets out a Lewis-inspired argument for unrestricted composition and develops a similar argument that the denial that things have temporal parts leads to metaphysically indeterminate existence. If the argument works, many moderate and seemingly commonsensical accounts of persistence turn out to be committed to metaphysical indeterminacy.

the world contains are n particles arranged into the form of a virus. Arguably, a virus would be a borderline case of something living. So by van Inwagen's answer, it is indefinite whether those things compose anything, and so, it appears, it will be indefinite whether the world contains exactly n things, or exactly $n + 1$ things.⁴¹

Why should indefiniteness in counting statements be thought to cause trouble for rivals to m-indeterminacy? The key thought is that such statements can be expressed in a very restricted vocabulary; just unrestricted quantifiers, identity, and standard logical operators. Sider begins by noting that the leading (supervaluational) semantic theory of indefiniteness require there to be multiple candidate extensions available for terms involved in a semantically indeterminate sentence. But it's hard to see what multiple candidate extensions there could be for identity or logical connectives. So the natural thought is that the multiple precisifications must be a matter of there being multiple precisifications (and so, different candidate domains) associated with an unrestricted quantifier.

However, the idea that there could be *semantic* indeterminacy in which domain an unrestricted quantifier ranges over is hard to swallow. If there are two candidate domains, one more extensive than the other, surely the less extensive is (definitely) not the domain of an *unrestricted* quantifier. So, if it is indefinite how many things there are, it doesn't look like that can be a matter of supervaluational indeterminacy. More surprisingly, Sider (2003, §2) argues that the same goes for other leading accounts of indefiniteness—all that are based on the notions of 'precisifications' in one way or another—including Williamson's epistemicism.⁴²

Of course, one who wants to resist m-indeterminacy has plenty of options. They might, with Sider and Lewis, adopt a metaphysics which avoids the relevant kind of indefinite existence. They might pick holes in the argument against a semantic or epistemic treatment of the relevant indefiniteness. Or they might construct some variant treatment of indefiniteness that can treat

⁴¹Various other among the candidate arenas for m-indeterminacy mentioned earlier may also be argued to be committed to indefiniteness in how many things there are. For example, the believer in the open future might be committed to it being indefinite how many things (tenselessly) exist; or the believer in vague sets might be committed to the indefiniteness of the size of the universe (perhaps expressible using higher-order logical resources). Sider (2001) argues that the personal identity theorist who denies perdurantism will be committed to similar claims.

Notice that if one buys into a Realist theory of Properties or states of affairs, one might have more cases of indefinite existence than at it might at first appear. See Barnes (2005).

⁴²Among other 'precisificational' theories of indefiniteness that Sider argues to be incompatible with indefinite existence is his own favoured error-theoretic proposal (Sider, 2003, §2). Of course, the classicist theory of m-indeterminacy above also appeals to precisifications, so if one offered this argument, one would need to check that it did not show that the theories can't be articulated in terms of this m-indeterminacy either.

it better. If one looks for knock-down proofs, one is apt to be disappointed. The friend of *m*-indeterminacy will, however, contend that their position ultimately wins out on the cost-benefit assessment of the various positions.

4.2 Implicit metaphysical indeterminacy

The indirect argument for *m*-indeterminacy is to argue that it is tacitly presupposed in other, more widely accepted theories. Trenton Merricks argues for something close to this.

The key question for Merricks is: what account are we to give of the way in which *words* (such as “Bald”) instantiate representational properties (such as *describing Harry*)? Merricks canvasses a range of responses, which include: (a) there is a single property expressed by ‘describing Harry’, and it’s metaphysically vague whether “Bald” has it; (b) there is a single property expressed by ‘describing Harry’, and it’s semantically vague whether “Bald” has it; (c) there are many properties P_1, \dots, P_n expressed by ‘describing Harry’, which divide exhaustively into those determinately possessed “Bald” and those it determinately fails to possess. Merricks argues that unless one endorses something relevantly like (a), then one will either end up with an implausibly refined ‘iterated’ theory (option (b)), or with a view where ‘vagueness is at root epistemic’ (option (c)). Merricks summarizes his view thus:

If the semantic details are fixed in full, then any alleged linguistic vagueness would dissipate were we informed of those details. In other words, if all propositions asserting that an object and word are related by a semantic relation have a determinate truth value, then any linguistic vagueness is explained entirely by our ignorance of the determinate facts of the matter and is, therefore, simply a species of epistemic vagueness. (Merricks, 2001, 153-4)

Of course, Merricks does not himself argue that one should pick the *m*-indeterminacy horn of this dilemma. But to the extent that one finds *independent* reason to reject epistemic indefiniteness, such considerations can be used to argue for implicit *m*-indeterminacy.

5 Why disbelieve in metaphysical indeterminacy?

Opponents of m-indeterminacy often claim that the notion is *unintelligible*, or *obviously vacuous*—often without much further elaboration.⁴³ Other objections to m-indeterminacy are methodological in character. One might argue the merits of a *unified* or ‘imperialistic’ treatment of indefiniteness—it is a theoretical vice to have to get *two* treatments of indefiniteness up and running rather than just one. But arguably at least some cases of indefiniteness aren’t plausibly accounted for in terms of m-indeterminacy, and so appeals to m-indeterminacy will always have this rather unparsimonious character. Another methodological objection focuses on the (alleged—see above) non-standard logics governing m-indeterminacy. One then argues that the revisionism of these logics is objectionable.⁴⁴ Lastly, there are *specific* objections, the paradigmatic example of which is Evans’ argument against metaphysically indeterminate identities. We look at this in detail below.

The bare accusations of incoherence or vacuity, and the methodological points, don’t seem terribly dialectically worrying. M-indeterminacy, particularly when paired with some well-worked out logical framework just doesn’t seem literally *incoherent*, and surely the claim that m-indeterminacy has no application is exactly the kind of thesis that should be up for revision—it can’t plausibly be counted a ‘Moorean truth’ to set alongside the existence of external objects or the law of non-contradiction. There may be methodological costs to a position that endorses m-indeterminacy, but one needs to weigh up such *pro tanto* costs against all the other sorts of factors that influence theory-choice. I will not discuss these sorts of objections further, concentrating instead on the specific arguments against instances of m-indeterminacy.

5.1 Metaphysically indeterminate identities

In a previous section, I sketched several areas in which m-indeterminacy might be invoked. In many of those, at least initially the claim would be that it is m-indeterminate what parts a thing has, or whether there exists such-and-such a thing, or similar. Metaphysically indeterminate

⁴³Contrast Lewis (1986, p.212), Hudson (2005, p.11), Dummett (1975) and Russell (1923) for paradigmatic dismissals. See Barnes (MSb, 2006, ch.2), Rosen and Smith (2004) for discussion.

⁴⁴See Eklund (forthcoming) for the first objection, based on the ‘unity’ assumption. See Tye (1994b) for an articulation of the association of non-standard logics and m-indeterminacy and Williamson (1994, ch.4.) for classic criticisms of the non-standard logics.

identities do not seem to be explicitly invoked. Yet perhaps the most-cited argument against worldly indeterminacy is the Evans-Salmon argument, which targets indefinite identities in particular. I discuss this in the next section. But first I consider the significance of the phenomenon it targets.

The key observation here is that *many* kinds of m-indeterminacy will end up entailing (modulo independently reasonable principles) m-indeterminate identities. Admittedly, many of the putative cases of m-indeterminacy described earlier do not explicitly appeal to m-indeterminate identity. But they may well be *committed* to m-indeterminate identities even so. For example, Hawley (2002) gives us the materials to argue that any theory committed to m-indeterminate existence will also be committed to m-indeterminate identity. Suppose it is metaphysically indeterminate whether the material thing *a* exists. Now consider the set of every material thing. And consider the set of every material thing except for *a*. By the axiom of extensionality, (determinately) these will be identical iff *a* doesn't exist. And since the latter is m-indeterminate, so is the former.

Some theories may not even explicitly feature m-indeterminate existence—but often the theories will explicitly appeal to m-indeterminacy in what properties an object has. Barnes (2005) argues that m-indeterminate property-instantiation will give rise to m-indeterminate existence, given a Realist theory of properties or states of affairs. Suppose one adopted the “Aristotelian” claim that (determinately) the Universal BEING *F* exists iff *F* is instantiated. Then if we have a single potential case of *F*-hood, and it is m-indeterminate in this case whether *F* is instantiated, then it will follow that it is m-indeterminate whether BEING *F* exists. The upshot is that m-indeterminacy in existence (and thereby, appealing to Barnes' argument, in suitable cases of property instantiation) will entail m-indeterminate identity. So the philosophical coherence of m-indeterminate identity assumes a pivotal role.⁴⁵

⁴⁵Other similar arguments can be devised. For example Weatherson (2003, pp.491-3) gives an argument that seems to convert cases of m-indeterminate parthood into cases of m-indeterminate identity. Consider an object *A*, such that it is indeterminate whether *B* is a part of it. Now consider the mereological fusion of *B* with *A*, *C*. Extensional mereologies tell us that *A* and *C* are identical iff they share all their parts (and this will be determinately the case if extensional mereology is determinately correct). So, m-determinately, *A* and *C* share all their parts iff *A* contains *B*. But the latter proposition is, by assumption, m-indeterminate. On plausible assumptions about the logic of ‘m-determinately’, it follows that it is m-indeterminate whether $A = C$.

Weatherson's own ambition for the argument is somewhat stronger. See Barnes and Williams (MS) for critical discussion of these arguments. A key point for both this argument and Hawley's earlier one is whether the terms ‘the fusion of *A* and *C*’ and ‘the set of every material thing’ are *rigid* in the sense relevant to the determinacy operator (whether they are *referentially determinate*). Nothing in the argument *as presently stated* turns on this—

These arguments do not turn on any feature of metaphysical indeterminacy per se. Similar arguments would show that indefinite instantiation leads to indefinite existence and so to indefinite identity. But the widespread perception is that the Evans argument is particularly problematic for m-indeterminate identity, and that semantic or epistemically indefinite identities are unproblematic.

Before turning to the question of whether the Evans argument amounts to a reductio of m-indeterminate identity, note that the arguments sketched above have deniable presuppositions: respectively, standard set theoretic principles and Realist theory of Properties. In principle, if one wished to avoid any threat of the Evans argument, one could start rejecting those bridge principles that convert metaphysically indeterminate property instantiation and existence into metaphysically indeterminate identity. This is another way that m-indeterminacy could interact significantly with independently interesting metaphysical views.⁴⁶

5.2 The Evans argument against metaphysically indeterminate identity.

The previous section argued that *many more* theories will be *implicitly* committed to m-indeterminate identities than are *explicitly* committed to them. Let us suppose that a local theory deploying m-indeterminacy is committed, implicitly or explicitly, to certain *de dicto* m-indeterminate identities.

Very roughly, the argument against such a theory, targetting its commitment to indefinite identity, is formulated as follows.⁴⁷ Suppose it were indefinite whether *a* and *b* were identical. Then *a* would be one of those things such that it is indefinite whether they're identical to *b*. But *b* is not one of those things, since it is quite definite that *b* is identical to *b*! But since *a* is one of a collection of things that *b* is not a member of, *a* and *b* must be distinct. More formally, writing ∇ for 'it is indefinite whether',⁴⁸:

but it will be of the utmost importance when we come to consider whether the Evans argument can be applied to them.

⁴⁶Hawley (2002) presents her argument as a potential counterexample to the determinate truth of the principle of extensionality within set theory with urelements.

⁴⁷I follow the presentation in Evans (1978). See also Salmon (1982).

⁴⁸So $\nabla p = \text{it is indefinite whether } p = \text{it is not definite that } p \text{ and it is not definite that } \neg p = \neg D p \wedge \neg D \neg p$.

1. $\nabla(a = b)$ (assumption)
2. $\lambda x[\nabla(x = b)]a$ (from 1)
3. $\neg\nabla(b = b)$ (premise.)
4. $\neg\lambda x[\nabla x = b]b$ (from (3)).
5. $a \neq b$ (from (2) and (4))

The expression $\lambda x[Fx]a$ is to be read ‘ a has the property of F ness’. (One should not get too worried by the appeal to property-talk here: the argument could equally be considered, as above, under an ultra-lightweight interpretation of ‘ $\lambda x[Fx]a$ as ‘ a is one of the F s’).⁴⁹ As formulated above the argument targets *indefinite identities* generally, rather than m-indeterminate identities in particular. But as we shall see shortly, there are ways of resisting the argument if we take the indefiniteness of identities to be *semantic* in origin, which aren’t obviously available if we start from an m-indeterminate identity.

There are just three steps and a single premise to be defended, and we examine these presently. If they are granted, we have the following result: supposing things to be indefinitely identical, we can conclude that they are distinct. However, this is not yet a formal *reductio* of the assumption that there is an indefinite identity; we have not reached something of the form $p \wedge \neg p$. To contradict $\nabla(a = b)$ we would need something like $\neg\nabla(a \neq b)$ rather than just $a \neq b$. The argument as currently formulated doesn’t give us this.

However, even as presently stated, if the argument works it may give us reason to reject indefinite identities. Not all arguments against a thesis take the form of deriving a contradiction from that thesis; deriving unpleasant consequences is often enough. What we putatively derive from indefinite identities is something of the form $p \wedge \nabla p$ (substituting $a \neq b$ for p). That

⁴⁹The claim here is that the *argument* may go through under this interpretation, not that plural talk can replace property talk in general—arguably they behave differently under modal embeddings, for example.

If one did want to interpret the argument in terms of properties, the charitable interpretation is to take such property-talk in what Lewis (1983) calls the ‘abundant’ sense, on which almost any meaningful predicate will stand for a property.

There are similar arguments that do not require appeal to property-talk at all. The philosophical issues are, however, moved rather than dissolved. See for example, the formulations in Williamson (1996). It is important to the proof that Williamson discusses that it be formulated in terms of free variables. The claim purportedly proved is the open sentence $x = y \supset D(x = y)$. From this we can see that from $\nabla(x = y)$ one can derive $\neg x = y$. As Williamson emphasizes, it does not automatically follow from this that $a = b \supset D(a = b)$ where a and b are singular terms, nor that from $\nabla(a = b)$ one can derive $a \neq b$. This will depend on issues about the functioning of singular terms exactly parallel to those raised below in the context of Evans’ argument.

statement alone might count as unpleasant enough to reject the assumption that leads to it.⁵⁰

If one is not convinced by this point, certain extra assumptions are needed to turn the above argument into a formal reductio. But what assumptions? Evans himself said that a reductio can be reached so long as one assumes the right kind of logic for D .⁵¹ That is correct—but there are other routes to the same conclusion. In particular, if we assume that the premises of the Evans argument are determinately the case (i.e. $D\nabla(a = b)$ and $D\neg\nabla b = b$), then we can conclude the conclusion is determinately the case ($D(a \neq b)$).⁵² But since $\neg D(a \neq b)$ follows uncontroversially from $D\nabla(a = b)$, this time we will have an explicit contradiction.⁵³ The strengthened premises will be plausible in many cases, and so without controversial assumptions about the logic of D we will derive a formal contradiction. Obviously this result is weaker than one might have hoped, since the needed premises are stronger. However, if successful it still places substantial constraints on what indeterminacy-involving metaphysical theories one can consistently endorse.⁵⁴

Let us suppose that if the argument works, it makes indefinite identities unacceptable. Does the argument work? The premise (3) is the definiteness of *self-identity*: this is supposed to be self-evident. The step from (1)-(2) is simply an instance of the form:

from F(N); infer: N is one of the F's

The step from (3)-(4) is perhaps best seen as a rule deriving from the converse:

from N is one of the F's; infer F(N).

⁵⁰Though see Heck (1998) for discussion.

⁵¹The logic that Evans mentions is S5—from which it follows that $Dp \supset DDp$ and $\neg Dp \supset D\neg Dp$. The S5 principles *prima facie* rule out ‘higher order’ indeterminacy—the idea that it can be indeterminate whether some p is determinately the case. Many would reject them on this account. However, S5 may be unnecessarily controversial. Williamson (1996) gives a proof that the B axiom $\neg p \supset D\neg Dp$ (and weakened variants thereof) are sufficient for extending the proof.

⁵²This makes some minimal assumptions about D : in particular that if C is the conclusion of a valid argument with determinately true premises, the conclusion is determinately true. But this is plausible.

⁵³From $D\nabla(a = b)$, $\nabla(a = b)$ follows. But that is an abbreviation for $(\neg D(a = b) \wedge \neg D(a \neq b))$. And one conjunct of this is just what we need.

⁵⁴Assuming an S5 logic for D , we don’t need to strengthen the premises, since $D\nabla(a = b)$ and $D\neg\nabla(b = b)$ will follow from $\nabla(a = b)$ and $\neg\nabla(b = b)$ respectively. So it’s easy to see why we might have a play-off between strength of the required premises and strength of the logic here.

Williamson (1996) describes one more route to turning the above fragment of an argument into a formal reductio. Rather than strengthen the premises or the logic of D , he looks at how D functions when combined with (the analogue of) an ‘actuality’ operator. He argues persuasively that the combined system of D with this operator allows one to reduce putative indeterminacy of identity to absurdity.

The contrapositive of this will take us from (3) to (4). Finally, the step from (2) and (4) to the conclusion that a and b are distinct is at heart, simply an application of the indiscernibility of identicals: if things are identical, then if the first is one of the F s, then the second must be too. Used contrapositively, this gives the result.⁵⁵

Notice that twice in the above we have appealed to *contraposition*. For example, what is used in moving from (2) and (4) to (5) is an instance of the *diversity of the dissimilar* (if a is one of the F s, and b fails to be one of the F s, then they must be distinct) rather than the *identity of indiscernibles* given above. Granted classical logic, the two principles are equivalent.⁵⁶ But this is one area in which revisionary logics might give us wriggle room. If basic propositional logic is up for grabs, might not contraposition fail?⁵⁷ A central question for the revisionist at this point is whether the contrapositive forms are any less intuitively obvious than the non-contraposed forms. Many feel that the diversity of the dissimilar, for example, is just as non-negotiable as the identity of indiscernibles.

Setting aside worries about contraposition, the main focus of the debate on Evans' argument has been whether the abstractive steps held good.⁵⁸ Analogous principles can lead to problems. For example, from 'It is contingent whether the number of the planets is 9', it famously does not follow that 'the number of the planets is one of the things such that it is contingent whether it is 9' (Quine, 1943; Smullyan, 1948). The generally accepted diagnosis here is that the trouble is the *non-rigidity* of 'the number of the planets'; what this term picks out depends on what possibility one is considering. In the case of indeterminacy, the consensus is that *referential indeterminacy* plays the same role as *non-rigidity* in blocking the move.⁵⁹ Only under the assumption that ' a ' and ' b ' are referentially determinate are the inferential moves in the above argument compelling. (For a fuller discussion, see in particular Lewis (1988).)

This is where it becomes important what kind of indefiniteness is at issue. For semantic theorists, the argument is resistable. If our linguistic conventions fail to settle whether "Kili-

⁵⁵For a fuller discussion of the exact moves required, see in particular Parsons (2000) and Heck (1998).

⁵⁶At least where the 'if' is read as the material conditional, as intended.

⁵⁷For formal details of the required principles, see (Parsons, 2000).

⁵⁸Some highlights of this discussion: Thomason (1982), Noonan (2004, 1990, 1982, 1984), Broome (1984), Lewis (1988), Parsons and Woodruff (1995). For more references to the literature, see Williamson (2003b, §8).

⁵⁹If we model definiteness as truth at each of a range of 'precisifications', as do supervaluations and ontic-precisification theories of m -indeterminacy, then the analogy can be made exact. Referential determinacy would be a matter of a term having the same reference at each precisification, just as rigidity is a matter of the term having the same reference at every possible world.

manjaro” picks out K or one of the other very similar agglomerations of rock in the vicinity, then we can expect ‘ $K = \text{Kilimanjaro}$ ’ to be an indefinite identity. But from the very start, referential indeterminacy is built into one of the terms involved, and that will enable us to resist the Evans argument.

But our main interest is in applying the Evans argument to cases of m-indeterminate identity, such as those derived in the previous section. There is at least a *prima facie* reason for thinking that in the case of m-indeterminate identities we cannot resist the abstractive steps in this way, so that for m-indeterminate identities the *de dicto* $\nabla(A = B)$ entails the *de re* $\lambda x[\nabla(x = B)]A$. To avoid the abstractive steps, we are supposing, one must diagnose referential indeterminacy in one of the terms involved. But the appeal to referential indeterminacy would appear to undermine the case that we are here dealing with *metaphysically* as opposed to *semantically* indeterminate identity.

This, however, presupposes that metaphysical and semantic indeterminacy are *exclusive*—that because there is referential indeterminacy in the terms involved, there cannot *also* be m-indeterminacy. But arguably referential indeterminacy can arise *in virtue of* m-indeterminacy. Suppose it were metaphysically unsettled where an object, Table, was located: it is either located between you and Wardrobe, or is in another room entirely, but there is no fact of the matter which one of these regions it is in. Now introduce the name “Front” to refer to whichever individual is directly in front of you. “Front” will be referentially indeterminate between Table and Wardrobe, and consequently “Table=Front” will be indefinite. So certainly we will get referential indeterminacy in “Front”. The source of this referential indeterminacy is not any lack of semantic conventions on your part, but simply the metaphysical indeterminacy in the location of Table. You laid down precisely the conditions a thing had to meet to be dubbed “Front”; it was metaphysically indeterminate which object met those conditions.

The reference relation has two ends: and indeterminacy in how the world is can generate referential indeterminacy just as much as a lack of semantic conventions specifying the conditions under which an object gets picked out. Arguably the sort of m-indeterminate identity generated out of m-indeterminate existence is of exactly this kind.⁶⁰ Despite appearances, then, the Evans argument fails in general even against m-indeterminate identities. The ban effected

⁶⁰Williams (2008) gives a detailed discussion of this point.

on *de re* indefinite identities, and *de re* m-indeterminate identities in particular, is still an interesting and substantive constraint, of course; but it does not have the widespread impact against the m-indeterminate instantiation, existence and parthood that it at first promised.⁶¹

Conclusion

Many metaphysical views will be committed to metaphysical indeterminacy. The appropriate methodological stance is to assess the comparative merits and demerits of the theories: dismissing positions out of hand simply because they appeal to metaphysical indeterminacy requires (at the very least) some special methodological pleading.

In order to compare theories, however, one must formulate them in a coherent way. This paper has surveyed frameworks for doing so, some which ‘embrace the liberal chic’ of deviant logics; others which are safely non-revisionary.

Some initial evaluation of the merits and demerits of indeterminacy-invoking metaphysical theories can be carried out in the abstract. We might examine whether a commitment to m-indeterminacy is really at the core of the theory, or whether it could be replaced by some other account of indefiniteness (here the Sider-Lewis arguments will be prominent). If the local metaphysical story, explicitly or implicitly, commits one to metaphysically vague identity, then we must look to see how and what cost it resists the Evans argument. Such general considerations can only be expected to take us so far, however. In the end, the case for metaphysical indeterminacy will be fought out, arena by arena, by considerations local to the respective metaphysical debates.

⁶¹Of course, some think that buying into a deviant logic gets one out of these arguments even for *de re* determinacy of identity. See Barnes (ming) for resistance in a classical setting.

References

- Akiba, K. (2000). 'Vagueness as a modality'. *Philosophical Quarterly*, **50**, 359–370.
- Akiba, K. (2004). 'Vagueness in the world'. *Noûs*, **38**, 407–29.
- Albert, D. Z. (1994). *Quantum mechanics and experience*. Harvard University Press, Cambridge, MA.
- Barnes, E. J. (2005). 'Vagueness in sparseness: a study in property ontology'. *Analysis*, **65**, 315–321.
- Barnes, E. J. (2006). 'Conceptual room for ontic vagueness'. Ph.D. Thesis, University of St Andrews.
- Barnes, E. J. (forthcoming). 'Indeterminacy, identity, and counterparts'. *Synthese*.
- Barnes, E. J. (MSa). 'Ontic vagueness: a guide for the perplexed'.
- Barnes, E. J. (MSb). 'What's so bad about ontic vagueness?'.
- Barnes, E. J. and Williams, J. R. G. (MS). 'Vague parts and vague identity'.
- Barnett, D. (Forthcoming). 'Is vagueness sui generis?'. *Australasian Journal of Philosophy*.
- Beall, J. C. and van Fraassen, B. (2003). *Possibilities and Paradox*. Oxford University Press, Oxford.
- Belnap, N. and Green, M. (1994). 'Indeterminism and the thin red line'. *Philosophical Perspectives*, **8**, 365–388.
- Broome, J. (1984). 'Indefiniteness in identity'. *Analysis*, **44**, 6–12.
- Dorr, C. (2003). 'Vagueness and ignorance'. *Philosophical Perspectives*, **17**, 83–114.
- Dummett, M. A. E. (1975). 'Wang's paradox'. *Synthese*, **30**, 301–324. Reprinted in Keefe and Smith (eds) *Vagueness: A Reader* (MIT Press: 1997) pp.99–119.
- Edgington, D. (1997). 'Vagueness by degrees'. In R. Keefe and P. Smith, editors, *Vagueness: A reader*, pages 294–316. MIT Press, Cambridge, MA.
- Eklund, M. (forthcoming). 'Deconstructing ontological vagueness'. *Canadian Journal of Philosophy*.
- Evans, G. (1978). 'Can there be vague objects?'. *Analysis*, **38**(13), 208. Reprinted in Keefe and Smith (eds) *Vagueness: A reader* (Cambridge, MA: MIT Press, 1997).
- Ewald, W. B. (1996). *From Kant to Hilbert: A source book in the foundations of mathematics*. Oxford science publications. Clarendon, Oxford. Translated into English from multiple languages.
- Field, H. H. (1998). 'Which undecidable mathematical sentences have determinate truth values?'. In H. G. Dales and G. Oliveri, editors, *Truth in Mathematics*, pages 291–310. Oxford University Press. Reprinted with postscript on categoricity arguments in Field (2001) pp. 332-360.

- Field, H. H. (2001). *Truth and the Absence of Fact*. Oxford University Press, Oxford.
- Field, H. H. (2003). 'Semantic paradoxes and the paradoxes of vagueness'. In J. C. Beall, editor, *Liars and Heaps*, pages 262–311.
- Fine, K. (1975). 'Vagueness, truth and logic'. *Synthese*, **30**, 265–300. Reprinted with corrections in Keefe and Smith (eds) *Vagueness: A reader* (MIT Press, Cambridge MA: 1997) pp.119-150.
- French, S. and Krause, D. (1995). 'Vague identity and quantum non-individuality'. *Analysis*, **55**, 20–26.
- Gallois, A. (2004). 'Comments on Ted Sider: *Four-dimensionalism*'. *Philosophy and Phenomenological Research*, **68**(3), 648–657.
- Greenough, P. (2003). 'Vagueness: A minimal theory'. *Mind*, **112**(446).
- Hawley, K. (1998). 'Indeterminism and indeterminacy'. *Analysis*, **58**, 101–106.
- Hawley, K. (2002). 'Vagueness and existence'. *Proceedings of the Aristotelian Society*, **102**, 125–40.
- Heck, R. G. (1998). 'That there might be vague objects (so far as concerns logic)'. *Monist*, **81**, 277–299.
- Heller, M. (1996). 'Against metaphysical vagueness'. *Philosophical Perspectives*, **10**, 177–85.
- Hirsch, E. (2004). 'Comments on Theodore Sider's *Four-dimensionalism*'. *Philosophy and Phenomenological Research*, **68**(3), 658–664.
- Hudson, H. (2001). *A materialist metaphysics of the human person*. Cornell University Press, Ithaca.
- Hudson, H. (2005). *The metaphysics of hyperspace*. Oxford University Press, Oxford.
- Kamp, J. A. W. (1975). 'Two theories about adjectives'. In E. Keenan, editor, *Formal Semantics of Natural Language*, pages 123–155. Cambridge University Press, Cambridge. Reprinted in Davis and Gillon (eds) *Semantics: A reader* (Oxford University Press, Oxford, 2004) pp.541-562.
- Keefe, R. (2000). *Theories of Vagueness*. Cambridge University Press, Cambridge.
- Keefe, R. and Smith, P. (1997). *Vagueness: A reader*. MIT Press, Cambridge, MA.
- Lewis, D. K. (1970). 'General semantics'. *Synthese*, **22**, 18–67. Reprinted with postscript in Lewis, *Philosophical Papers I* (Oxford University Press, 1983) 189–229.
- Lewis, D. K. (1983). 'New work for a theory of universals'. *Australasian Journal of Philosophy*, **61**, 343–377. Reprinted in Lewis, *Papers on Metaphysics and Epistemology* (Cambridge University Press, 1999) 8–55.
- Lewis, D. K. (1986). *On the Plurality of Worlds*. Blackwell, Oxford.
- Lewis, D. K. (1988). 'Vague identity: Evans misunderstood'. *Analysis*, **48**, 128–30. Reprinted in Keefe and Smith (eds) *Vagueness: A reader* (Cambridge MA: MIT Press 1997).

- Lewis, D. K. (1993). 'Many, but almost one'. In K. Campbell, J. Bacon, and L. Reinhardt, editors, *Ontology, Causality and Mind: Essays on the philosophy of D. M. Armstrong*. Cambridge University Press, Cambridge. Reprinted in Lewis, *Papers on Metaphysics and Epistemology* (Cambridge University Press, 1999) 164–82.
- Lowe, E. J. (1994). 'Vague identity and quantum indeterminacy'. *Analysis*, **54**, 110–114.
- Lowe, E. J. (1997). 'Reply to Noonan on vague identity'. *Analysis*, **57**, 88–91.
- Lowe, E. J. (1999). 'Vague identity and quantum indeterminacy: further reflections'. *Analysis*, **59**, 328–330.
- Markosian, N. (2004). 'Two arguments from Sider's *Four-dimensionalism*'. *Philosophy and Phenomenological Research*, **68**(3), 665–673.
- McGee, V. (1997). 'How we learn mathematical language'. *Philosophical Review*, **106**, 35–68.
- McGee, V. and McLaughlin, B. (1994). 'Distinctions without a difference'. *Southern Journal of Philosophy*, **supp XXXII**, 203–251.
- McKinnon, N. (2003). 'Vague simples'. *Pacific Philosophical Quarterly*, **84**, 394–397.
- Merricks, T. (2001). 'Varieties of vagueness'. *Philosophy and Phenomenological Research*, pages 145–157.
- Noonan, H. (1982). 'Vague objects'. *Analysis*, **42**, 3–6.
- Noonan, H. (1984). 'Indefinite identity: reply to Broome'. *Analysis*, **44**, 117–62.
- Noonan, H. (1990). 'Vague identity yet again'. *Analysis*, **50**, 157–62.
- Noonan, H. (1995). 'Vague identity and quantum indeterminacy'. *Analysis*, **55**, 14–19.
- Noonan, H. (2004). 'Are there vague objects?'. *Analysis*, **64**, 131–4.
- Parsons, T. (2000). *Indeterminate identity*. OUP.
- Parsons, T. and Woodruff, P. (1995). 'Worldly indeterminacy of identity'. *Proceedings of the Aristotelian Society*, pages 177–91. Reprinted in Keefe and Smith (eds) *Vagueness: A reader* (Cambridge MA: MIT Press 1997).
- Parsons, T. and Woodruff, P. (1997). 'Indeterminacy of identity of objects and sets.'. *Philosophical Perspectives*, **11**, 321–348.
- Quine, W. V. (1943). 'Notes on existence and necessity'. *The Journal of Philosophy*, **40**(5), 113–127.
- Rayo, A. and Uzquiano, G. (2006). *Absolute Generality*. Oxford University Press, Oxford.
- Rosen, G. and Smith, N. J. J. (2004). 'Wordly indeterminacy: A rough guide'. *Australasian Journal of Philosophy*, **82**, 185–98.
- Russell, B. (1923). 'Vagueness'. *Australasian Journal of Psychology and Philosophy*, **1**, 84–92. Reprinted in Keefe and Smith (eds) *Vagueness: A reader* (Cambridge MA: MIT Press, 1997) pp.61–68.

- Sainsbury, M. (1989). 'What is a vague object?'. *Analysis*, **49**, 99–103.
- Sainsbury, M. (1994). 'Why the world cannot be vague'. *Southern Journal of Philosophy*, **33**, 63–82.
- Salmon, N. (1982). *Reference and Essence*. Blackwell, Oxford, 1st edition.
- Shapiro, S. and Wright, C. (2006). 'All things indefinitely extensible'. In A. Rayo and G. Uzquiano, editors, *Absolute Generality*, page 255304. Oxford University Press, Oxford.
- Sider, T. (2001). *Four-dimensionalism*. Oxford University Press, Oxford.
- Sider, T. (2003). 'Against vague existence'. *Philosophical Studies*, **114**, 135–146.
- Sider, T. (2004). 'Precis of *Four-dimensionalism* and reply to Gallois, Hirsch and Markosian'. *Philosophy and Phenomenological Research*, **68**(3), 642–647; 674–687.
- Sider, T. (2007). 'Ontological realism'. In D. Chalmers, D. Manley, and R. Wasserman, editors, *Metametaphysics*. OUP, Oxford.
- Smith, D. P. (2007). 'Vague singulars, semantic indecision, and the metaphysics of persons'. *Philosophy and Phenomenological Research*, **74**, 569–585.
- Smith, N. J. J. (2005a). 'A plea for things that are not quite all there, or: Is there a problem about vague composition and vague existence?'. *Journal of Philosophy*, **102**, 381–421.
- Smith, N. J. J. (2005b). 'Vagueness as closeness'. *Australasian Journal of Philosophy*, **83**, 157–83.
- Smullyan, A. F. (1948). 'Modality and description'. In L. Linsky, editor, *Reference and Modality*. Oxford University Press, Oxford. First published in *The Journal of Symbolic Logic* 13, 1, 31–7.
- Sorensen, R. (1997). 'Vagueness'. In E. N. Zalta, editor, *The Stanford Encyclopedia of Philosophy*. Fall 2006 edition. <http://plato.stanford.edu/archives/fall2006/entries/vagueness/>.
- Thomason, R. (1982). 'Identity and vagueness'. *Philosophical Studies*, **42**, 329–32.
- Tye, M. (1990). 'Vague objects'. *Mind*, **99**, 535–557. Reprinted with omissions in Keefe and Smith 1997.
- Tye, M. (1994a). 'Sorites paradoxes and the semantics of vagueness'. *Philosophical Perspectives*, **8**, 189–206. Reprinted with omissions in Keefe and Smith 1997.
- Tye, M. (1994b). 'Vagueness: Welcome to the quicksand'. *Southern Journal of Philosophy*, **33 Supp**, 1–22. Reprinted with omissions in Keefe and Smith 1997.
- van Inwagen, P. (1990). *Material Beings*. Cornell University Press, Ithaca and London.
- Weatherson, B. (2003). 'Many many problems'. *Philosophical Quarterly*, **53**, 481–501.
- Weatherson, B. (2004). 'The problem of the many'. Fall 2004 edition. <http://plato.stanford.edu/archives/fall2004/entries/problem-of-many/>.

- Wiggins, D. (1968). 'On being in the same place at the same time'. *Philosophical Review*, **77**, 90–95.
- Williams, J. R. G. (2008). 'Multiple actualities and ontically vague identity'. *Philosophical Quarterly*, pages 134–154.
- Williams, J. R. G. (forthcoming). 'Supervaluations and logical revisionism'. *The Journal of Philosophy*.
- Williamson, T. (1994). *Vagueness*. Routledge, London.
- Williamson, T. (1996). 'The necessity and determinacy of distinctness'. In S. Lovibond and S. G. Williams, editors, *Identity, Truth and Value: Essays for David Wiggins*, pages 1–17. Oxford University Press, Oxford.
- Williamson, T. (2003a). 'Everything'. *Philosophical Perspectives*, **17**, 415–465.
- Williamson, T. (2003b). 'Vagueness in reality'. In M. Loux and D. Zimmerman, editors, *The Oxford Handbook of Metaphysics*, pages 690–716.
- Wright, C. (2003). 'Vagueness: A fifth column approach'. In J. C. Beall, editor, *Liars and Heaps: New essays on paradox*, pages 84–105. Oxford University Press, Oxford.
- Zermelo, E. (1930). 'Über Grenzzahlen und Mengenbereiche: Neue Untersuchungen über die Grundlagen der Mengenlehre'. *Fundamenta Mathematicae*, **16**, 29–47. Translated by Michael Hallett in Ewald (1996), pp.1219–33.