

Vague objects with sharp boundaries

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§1. In this article I shall consider two seemingly contradictory claims: first, the claim that *everybody who thinks that there are ordinary objects has to accept that they are vague*, and second, the claim that *everybody has to accept the existence of sharp boundaries to ordinary objects*. The purpose of this article is of course not to defend a contradiction. Indeed, there is no contradiction because the two claims do not concern the same "everybody". The first claim, that all ordinary objects are vague, is a claim that stems both from common sense intuitions as well as from various types of ontologies of ordinary objects. This puts then pressure on theories of vagueness to *account* for the vague nature of ordinary objects – but, as we shall see, all theories of vagueness have to accept the existence of sharp thresholds. This is obvious in the case of epistemicism, and it is a well-known defect of supervaluationism, but as we will see friends of metaphysical vagueness do have to endorse the existence of sharp thresholds in their theory as well. Consequently, there are reasons for dissatisfaction with these accounts, since they do not seem to be able to do the job we asked them to do.

§2. Let us start with the claim that all ordinary objects are vague. Many intuitive cases of possession of vague properties spring to mind, such as somebody's baldness, the reddish-but-still-a-bit-orange colour of a tomato, the vagueness of spatial boundaries of a mountain ("Is this bit of snow part of Mont-Blanc or is it part of the neighbouring Mont-Maudit?"), and many other. The cases I will be mostly interested in below concern a type of vagueness one might wish to call "existential vagueness", that is, vagueness concerning the question of whether an entity is (counts as) an ordinary object or not (perhaps, this type of vagueness is close to what one can have in mind when talking about "metaphysical vagueness").

Ordinary objects are those that populate the domain of ordinary quantification: mountains, people, apples, tables, clouds, lizards, and so on. Extra-ordinary objects are those that typically come out of a process of unrestricted mereological composition, as for instance Bernard, who is an aggregate of my nose, the top half of Mont-Blanc, three polar bears, and the northern hemisphere of the half-eaten apple on my kitchen table. Extra-ordinary objects might be vague (for instance, there might be vagueness due to their colour, baldness, and so on), but their spatio-temporal boundaries and their existence are typically well-delimited, or at least they usually easily can be. Granted, if they are defined in the manner I just did it with Bernard, since such objects are composed of ordinary objects or pieces of ordinary objects, they will inherit their spatio-temporal vagueness. But extra-ordinary objects do not have to be defined in such an imprecise way. Indeed, one can simply stipulate their spatial and temporal boundaries, and define them as precisely as one needs. For instance, instead of saying that the extra-ordinary object Bernard is composed of my nose and the top half of Mont-Blanc, one can say that Bernard is composed of my nose from this-and-this point to this-and-this point, and the top half of Mont-Blanc from this-and-this point to this-and-this point, simply by definition. Ordinary objects, on the other hand, seem to suffer from irremediable existential vagueness, as we shall now see.

§3. Suppose, first, that you think that ordinary objects are mind-independent – that is, there *are* tables, apples, lizards, people, and mountains, *in the world*. Suppose, further, that you don't believe in the existence of extra-ordinary objects like Bernard. In short, you are a friend of restricted mereological composition and a realist about ordinary objects. As David Lewis (1986, p.212-213) and Peter van Inwagen (1990) have shown at length, you are then committed to existential (metaphysical) vagueness – that is, the claim that such objects are vague "in themselves" or "in the world" (i.e. that vagueness is a metaphysical, and not a linguistic or epistemic, phenomenon). Indeed, since the spatio-temporal boundaries of ordinary objects, like Mont-Blanc's, are vague, it is then a vague matter whether mereological composition obtains or not, which means that it is a vague matter whether there *exists* such a mereological sum or not. As Lewis remarks, in general, any friend of restricted composition will have to specify when composition takes place and when it does not, and since such specifications will always typically be vague, one has to embrace a claim of existential vagueness if one is a realist about ordinary objects.

Suppose, then, that you follow Lewis' advice and reject the claim of restricted composition and accept that in addition to ordinary objects there *are* objects like Bernard – i.e., the claim

that objects 'generated' by *unrestricted* mereological composition are as real as ordinary objects (still under the assumption that both are mind-independent). In this case, in your ontology, any mereological sum counts as an object, and since mereological sums do typically have well-delimited spatio-temporal boundaries, it seems that you are not committed to accepting existential vagueness. But one thing you will want to be able to do is to *distinguish* between ordinary objects like mountains or apples and extra-ordinary objects like Bernard. In your domain of quantification, quantifiers wide open, both types of objects will be included. But if, to preserve at least some intuitions and common sense claims, you want to be able to quantify only over ordinary objects, for instance for purposes concerning ordinary language, you will then have to find some way of *selecting* in the unrestricted domain of quantification a subset of objects suited for the purposes of 'ordinary quantification'. But then, for the same reasons as before, any such restriction will be vague.

Of course, the sense in which a friend of unrestricted composition believes in the category and special status of ordinary objects is a different, and less metaphysically loaded, sense than the one in which the friend of restricted composition believes in them. But still, even if it is a weaker sense, it is a relevant one – indeed, it is the only sense in which the friend of unrestrictedness can have any theoretical means to say that there are mountains, tables, or apples and that they are somehow special, or at least that they can be somehow distinguished from gerrymandered Bernard-like entities.

§4. Perhaps then one might wish to drop the assumption that ordinary objects are mind-independent. One way to do this is to claim that they do not exist. If a radical nihilism about ordinary objects is true, then of course any worries about their existential vagueness disappears – which might be seen as a good reason to become a nihilist in the first place.

But even nihilists usually want to be able to *talk* about ordinary objects, and say things like "Mont-Blanc is a beautiful mountain". This is why nihilists such as Heller (1990) or Merricks (2001) vindicate talk about ordinary objects by saying that, even if they do not exist, something else does – a 'something else' which can play the role of ordinary objects for ordinary language purposes. What nihilists typically say is that wherever we thought there was an ordinary object, like a mountain, there is an arrangement of fundamental components (particles, properties, or whatever your favourite ontology gives you) – in short, '*atoms arranged mountainwise*'. Nihilists then claim that for any purposes, theoretical or ordinary, atoms arranged mountainwise can play the same role mountains would play, and thus we do not need to populate our ontology with mountains. Heller's is a nice way to understand this

claim: mountains, as ordinarily quantified over in ordinary talk, are *conventions*. In this view, strictly speaking, there are no mountains, but it is useful for us to call such and such an arrangement of atoms a "mountain" and thus we have a linguistic convention governing the word "mountain" which is useful to us for many practical purposes. Mountains, as well as all ordinary objects, are then conventional objects¹.

The important point for us to note here is that nihilists such as Heller, Merricks or van Inwagen are thus not hard-core nihilists who would deny all possibility of talking about ordinary objects. But only such a hard-core approach would entirely eliminate all worries concerning vagueness (indeed, any such worries would simply not even arise). Conventionalist nihilists, like Heller (and similarly for Merricks and van Inwagen), who do accept that there is *some sense*, even if only a conventional and linguistic one, in which there are ordinary objects, have to accept that *in this sense* they are vague. Indeed, as before, either the relevant conventions obey rules of restricted composition, in which case they are vague, or they endorse rules of unrestricted composition, in which case vagueness will arise as soon as one wants to make any meaningful distinctions between mountain-like ordinary objects and Bernard-like extra-ordinary ones. The nihilist simply has the same problems as her realist opponent has (but of course, again, in her own sense of 'ordinary object').

§5. The cumulative effect of the considerations of the preceding sections puts then pressure on any theory of vagueness to account for what seems to be an irremediable feature of ordinary objects, whether they are understood as objects of common sense intuitions, mind-independent entities, or nihilist conventions. For, as we have seen, however one conceives of the nature of ordinary objects, in the sense in which one accepts that there are any is a sense in which one has to accept that they are vague. In what follows, let us then examine how the various types of theories of vagueness on the market try to provide such an account.

§6. The *epistemicist* is the only one who explicitly endorses and defends the thesis that the *prima facie* claim about vagueness of ordinary objects is, strictly speaking, false. Indeed, at the very heart of epistemicism lies the central claim that, contrary to appearances, Mont-Blanc *does* have *precise* spatio-temporal boundaries – it's just that we don't know them. This ignorance is usually said to come from considerations about language and about our use of

¹ Merricks (2001) makes an exception for conscious objects, like human beings, and van Inwagen (1990) famously makes an exception for living beings. Heller does not make any such exceptions.

words like "Mont-Blanc" or "the apple". I shall come back to epistemicism at the end of this article, for now I am interested in its two main rivals who officially reject the idea of there being sharp boundaries to ordinary objects. I shall quickly consider supervaluationism, before spending more time on theories of metaphysical vagueness.

Supervaluationism is a type of view that claims that vagueness is a linguistic phenomenon. One can say here that Mont-Blanc is spatially vague simply because nobody ever defined precisely enough the term "Mont-Blanc" in a way that would delimitate with full precision its spatial boundaries (and similarly for all vague predicates, like "bald", "red", "orange", "big", and so on). There are, however, possible *admissible precisifications* of vague terms like "Mont-Blanc", whose referents are, in short, candidates for being *the* Mont-Blanc. Truth-values of sentences containing such vague terms are then given by the rule of supervaluations, as follows. A sentence like "Mont-Blanc is a high mountain.", that contains vague terms, is such that it is true under all precisifications of these vague terms – thus it is "super-true". Similarly, a sentence like "Mont-Blanc is the smallest mountain in the Alps." is "super-false" since it is false under all precisifications. A sentence like "Mont-Blanc is a difficult mountain to climb." is true under some precisifications of "Mont-Blanc" and of "difficult" but false under other – in such cases, according to supervaluationism, the sentence is then neither true nor false (its truth-value is *Indeterminate*). Supervaluationism thus endorses a three-valued logic, rejects bivalence, but preserves the law of excluded middle. (Indeed, " $P \vee \neg P$ " is super-true. Classic verifunctionality is thus not preserved since even if P has the truth-value Indeterminate " $P \vee \neg P$ " is super-true.)

The point of endorsing such a non-classical three-valued logic is to account for genuine cases of vagueness, but this account fails, for two reasons. The first is well-known and concerns the fact that in the supervaluationist's own terms it *is* super-true that

$$\exists n(Fa_n \wedge \neg Fa_{n+1})$$

The illustrative example often used to paraphrase this expression is that "There is an n such that a person with n hairs is bald and a person with $n+1$ hairs is not bald.", which in our case of spatial vagueness of Mont-Blanc becomes something like "There is a spatial location such that Mont-Blanc is not located at it, and there is an immediately adjacent location such that Mont-Blanc is located at it." Such sentences come out as super-true – i.e. true under all admissible precisifications – from the supervaluationist's machinery. Of course, supervaluationism does not imply and does not say that there is a *particular* sharp threshold

between someone who is bald and someone who is not (say, 147 hairs) or that there is a *particular* point where Mont-Blanc begins and where it ends. But it does imply that there is *some such* threshold, which in addition to going against the idea of there being genuine cases of vagueness yields a situation where one has to accept that there are true existential statements which have no true instances (see Hyde (2011)).

The second reason why this account fails and why it forces us, contrary to the desideratum supervaluationists had at start, to reject the existence of sharp thresholds, is one that it shares with the theory of metaphysical vagueness which also appeals to a three-valued logic, to which I shall turn my attention now. (Note that some versions of the theory of metaphysical vagueness actually turn out to be quite close to supervaluationism, such as the modal view of Akiba (2004) and Barnes (2010). The main point I want to make concerning these views – namely that they have to endorse the existence of sharp thresholds – applies to all of them.)

§7. According to what we may call 'metaphysicism', vagueness is a metaphysical phenomenon. In short, it is not our language or our ignorance which are responsible for there being genuine cases of vagueness, rather the world itself is vague – Mont-Blanc, for instance, is thus a metaphysically vague object. This view, then, takes the phenomenon of vagueness at face value. The world is vague. Objects are vague. Mont-Blanc is a metaphysically vague object that has vague boundaries, and the reason why it is hard to say where/when it begins is that it does not *have* a precise spatial/temporal beginning.

The notion of metaphysical vagueness is often taken to be a primitive one (see, for instance, Williams (2008)), or it is defined, probably with some amount of circularity, in terms of the operator "it is indeterminate that" (see, for instance, Tye (1990)). However one defines – or not – this notion, it is a very useful one in solving problems concerning the *sorites*: in a sorites, at least one (but usually more) premise of the argument is neither true nor false, and consequently it is not true, and thus the argument is not valid. Classical bivalent logic is thus abandoned in favour of a many-valued one, and typically, both bivalence and the law of excluded middle are thus discarded. Perhaps the simplest and most obvious logic to be used here is a three-valued one, such as Kleene's. Truth-tables for disjunction, conjunction, and negation look then like this :

∨	T	I	F
T	T	T	T
I	T	I	I
F	T	I	F

∧	T	I	F
T	T	I	F
I	I	I	F
F	F	F	F

¬	
T	F
I	I
F	T

where "I" stands for "neither true nor false" (as opposed to "true *and* false").

To focus on disjunction, it is true when at least one of the disjuncts is true, and false when both disjuncts are false, exactly as in classical bivalent logics. Otherwise, it is Indeterminate. The idea behind this is that if, say, one disjunct is F and the other is I, we then don't have enough information to calculate the classical truth-value of the disjunction, and thus it is I. Similarly for other cases. This is how in such a three-valued logic $P \vee \neg P$ is not a logical truth (that is, the law of excluded middle is abandoned), and $P \wedge \neg P$ is not a logical falsehood – a contradiction which is not false (when P has the truth-value I) ! Classical tautologies are thus not valid.

Still focusing on disjunction, in classical logic, one can use disjunction elimination in proofs like this one :

$\neg P \vee \neg Q \vdash \neg(P \wedge Q)$			
1		$\neg P \vee \neg Q$	
2			
3			
4			$\frac{P \wedge Q}{\neg P}$
5			P
6			$\neg(P \wedge Q)$
7			
8			
9			$\frac{P \wedge Q}{\neg Q}$
10			Q
11			$\neg(P \wedge Q)$
12			$\neg(P \wedge Q)$

2	∧E, 3
5-6	¬I, 3-5
7	7
8-10	∧E, 8
11	¬I, 8-10
12	∨E, 2-6, 7-11

In Kleene-like three-valued logics, however, such a classical disjunction elimination, which is crucial for this type of proofs, is not available. Indeed, there are more than the two cases where $\neg P$ is true (step 2) and where $\neg Q$ is true (step 7) : there are also the cases where one of the disjuncts has the truth-value I. But from these latter cases we cannot derive the

conclusion, since if, for instance, $\neg P$ is I and P is I we don't have a contradiction of the type $P \wedge \neg P$ and thus we cannot proceed to step 6.

These considerations show us the technical costs of rejecting classical bivalent logics. Such costs, of course, might be worth paying if they can help us in solving problems concerning vagueness, the sorites, and related worries. As we shall see below, however, this strategy will fail – and, it will fail for conceptual reasons which are nicely exhibited by the use of formal tools such as Kleene-like three-valued logics, but which can also be formulated independently of these formal tools, as we shall see below.

§8. So, let us now get back to the metaphysical theory of vagueness. Even if one were ready to pay the aforementioned costs of a three-valued logic, or if one used a strategy similar to supervaluationism, it would not do the trick. Indeed, at the heart of metaphysicism lies the idea that the bivalent passage from truth to falsehood is too abrupt, and that it needs to be replaced by a smoother passage through the truth-value Indeterminate. Trouble is, a transition between T and I, and between F and I is just as abrupt and just as counter-intuitive as the abrupt transition between T and F (accepted from the start by epistemicists) : such sharp thresholds, even if there is now two of them instead of one, are just not what we have in the case of a sorites, where philosophical problems arise precisely because of the *lack* of such sharp transitions. In cases of vagueness and in the case of a sorites, we need to account for a smooth and continuous change in truth values between the different steps of the argument, and as a formal tool a three-valued logic just does not give us what we need.

Perhaps then, a fuzzy logic *à la* Lukasiewicz and Tarski can do the job. Such a logic takes truth-values to be like real numbers ranging between 0 and 1 – $\{0 \leq x \leq 1\}$ – where, say, 0.5 means "half-true", 0.1297763 means something like "a little bit true", and so on. But even without going into the details of such a logic, it is not only clear that it bears the same amount of 'technical costs' as a three-valued logic, but it appears that it cannot avoid the existence of sharp thresholds either. To see this, let us consider a game Mark Heller played with God in Heller (1996) and let us see how it is relevant for our discussion. God stands at the top of Mont-Blanc and says "I am on Mont-Blanc". She then starts descending in the direction of Chamonix and every time she takes a step she says "I am on Mont-Blanc". The thing is, God is omniscient, she is capable of taking very, very, tiny steps, and she is always cooperative and telling the truth. Thus, there is some point where she will take a step and where she will *stop saying* "I am on Mont-Blanc". If epistemicism is true, she will say "I am not on Mont-Blanc". If supervaluationists have it right or if God is a friend of the metaphysical theory and

of Kleene-like three-valued logics, then she will probably say "It is now indeterminate whether I am on Mont-Blanc or not". What exactly she will say under metaphysicism and a fuzzy logic framework is not entirely clear – perhaps it will be something like "It is now almost true but a little less than true that I am on Mont-Blanc" – but what *is* clear is that there will be one precise point where she will stop saying "I am on Mont-Blanc". In terms of a fuzzy logic framework this situation amounts to the passage from 1 (truth) to something else than 1 (something else than truth). Numerically speaking, so to say, this makes a tiny difference – the real number closest to 1 will be very close to 1 indeed – but conceptually speaking what we have here is a sharp and precise threshold between truth and something else than truth, which is close to it but which just is not truth.

§9. The conceptual and philosophical situation we find ourselves in is one where we see that, by trying to avoid an allegedly unacceptable commitment of the epistemicist to the existence of sharp thresholds, the competing views and their logics actually only 'postpone' the problem, but do not avoid it.

Epistemicism endorses the existence of sharp thresholds from the start, the others just stumble against it later on in their theory. Neither conceptually and philosophically, nor from the logical point of view, the competition thus does not seem to do a significantly better job than epistemicism on this point (that is, when it comes to trying to avoid sharp thresholds). Furthermore, non-bivalent logics do bring on us the burden of the technical costs mentioned above.

As a result, it appears that, contrary to what we might have thought, many-valued logics are not well suited to (success)fully treat the phenomenon of vagueness, and consequently that the theories which employ such logics are not entirely satisfactory. To my mind, the epistemicist's strategy is a more promising one: recognize the problem from the start, and try to deal with it head-on, rather than trying to avoid it (or postpone it). Being less costly when it comes to logic (and the conceptual consequences it has), and being more direct and honest about the existence of sharp thresholds, epistemicism seems to have a better start than its competitors. Of course, a good start is just a beginning. Epistemicism still owes us an explanation of the nature of the sharp thresholds it postulates and of our ignorance of them (I discuss this and give it a try in Benovsky (2011))².

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