

Today I will discuss vagueness and its connection to some issues in logic and metaphysics.

There are three main types of views about the nature of vagueness: First, the linguistic or semantic view, according to which the vagueness of language is essentially a matter of the way language relates to the world. Second, there is the worldly view, according to which the vagueness of language is a direct reflection of some kind of vagueness or indeterminacy that resides in the world itself. On this view, the vagueness of language is to be understood in terms of some metaphysical kind of vagueness. Roughly, language is vague because the world is, and language describes the world. Third, there is the epistemic view of vagueness, according to which vagueness is primarily a matter of our knowledge or ignorance. Very broadly, the idea here is that vagueness is a special kind of ignorance: we do not know the exact whereabouts of the boundaries drawn by our words.

One of the things I will be focusing on is the reasons we might have for going for either the linguistic or the metaphysical conceptions of vagueness. I will look at various things that seem to support one or the other of these views, including the logical problems of vagueness. But as we look at these issues, I believe that something will emerge that is actually independent of which we go on the question of the nature of vagueness. This will concern the notion of a vague object, an object that does not have sharp boundaries. However vagueness is ultimately construed, attention to the notion of a vague object has implications for the way we should think of composition, the relationship between an object and its parts.

Now the topic of vagueness is usually introduced by an ancient puzzle known as the sorites paradox. Since some of you might not be familiar with this puzzle, I will quickly present a couple of versions of it.

The sorites paradox gets its name from the Greek word for “heap”, and the word “sorites” means something like “heaper”. Suppose that there is a typical heap of sand on the floor. Now consider the question whether the removal of one grain of sand from a heap of sand can destroy the heap. We are strongly tempted to think that one grain of sand cannot make the difference between heap and non-heap, so that if we take one grain away from any heap, a heap will remain. But the principle “One grain does not make a difference” leads to an unacceptable conclusion.

To see this, suppose we start with a heap that is composed of 10,000 grains of sand, and we begin removing grains, one by one. Eventually, there will just be one grain left, and at that stage there will no longer be a heap. But if we apply the principle at every removal of a grain, we will be left with the conclusion that a heap still remains, even when there is one grain left. We apply the principle at the first removal, and it entails that the 9,999 grains that are left still form a heap.

Apply it at the second removal, and we get that the 9,998 grains form a heap. Apply it over and over, 9,999 times, once at each removal, and we will have the conclusion that the one grain forms a heap.

Thus the principle that one grain does not make a difference, plus the fact that you can go from heap to non-heap by the long series of removals of single grains leads to a contradiction. Thus this is a paradox; we are led from things we want to believe to something we don't want to believe, by seemingly impeccable steps of reasoning.

There are many analogues of the sorites that concern things other than heaps; we get similar results from the principle that if a person who is not bald loses one hair then he does not thereby become bald. Put another way, the loss of one hair cannot make a person become bald. But of course if someone does lose all his hairs, one by one, over the course of many years, he does go from non-bald to bald. And consider the principle that if two shades of color are so similar that they cannot be easily distinguished by looking at them side by side, then if one is red, so is the other. This principle leads to contradiction as well, for it is possible to arrange a series of 10,000 colored tiles ranging from red to yellow, such that no two of them are exactly the same shade of color, yet the members of any adjacent pair in the series are actually indistinguishable by just looking at them.

So there are many words for which one can generate a sorites paradox. For many words, we can articulate a principle that says roughly that tiny differences between things cannot make for a difference in the applicability of the word. We may call this a “tolerance of tiny change” principle, or “tolerance” principle, for short. When there is a tempting tolerance principle for a word, you can make a paradox.

Now, contemporary philosophers call words for which you can make one of these paradoxes “vague” words. This notion of vagueness contrasts with the notion of “sharpness”; the vague words do not have a sharp line of applicability. This lack of sharp line seems to be articulated by the tolerance principle.

But we cannot rest satisfied by saying that vague words are words for which a tolerance principle holds. For tolerance principles lead to contradictions, and we don't want to believe any contradictions if we don't have to. Thus we want an account of words that seem to obey tolerance principles, an account that does not lead us to contradiction.

The most direct account is the epistemic account of vagueness, which says that the tolerance principles are simply straightforwardly false, and that there is in fact a sharp line for words like heap and bald and red. Yet we do not know where this line is, and so we are tempted to think that there is not one. But on this view, we are simply making a mistake, thinking that since we don't know where the sharp divide is, there is not one at all.

Those who have defended the epistemic account, most prominently Timothy Williamson, try to offer an explanation of our ignorance of the location of the sharp boundary. But even Williamson admits that on the face of it, the epistemic account is extremely implausible. We feel strongly that we are not simply ignorant about something; it seems like no amount of research of any sort will tell us which loss of a hair made a man bald, or which is the last red tile in the series of 10,000 tiles. Imagine trying to get a research grant to find out which one is the last red tile!

I will mostly ignore the epistemic account in what follows, as it seems to be such a desperate idea. We hope to be able to give some other kind of account.

Now most people are initially inclined to some kind of semantic account of vagueness when they are introduced to the sorites paradox. They say something like this: the word “red” is not well-defined, or: We have not ever settled on an exact meaning for the word. In this vein, we might note that if we really wanted to, we might be able to stipulate a sharp line for the word. It is easy to see how we might do this in the case of the predicate “tall woman”, for example. We might stipulate that all women who are exactly seventy inches tall or taller are tall, and the rest are not tall.

This seems like a sensible picture of the words that generate typical sorites paradoxes: our words lack sharp boundaries because we simply never gave them sharp boundaries. There are various different ways to make this idea more precise. One idea is that vagueness is a kind of lack of meaning: the meaning of “tall woman”, for example has been filled in enough to settle that women under five foot four are not tall, that women over five foot ten inches are tall, but the meaning has not been filled-in enough to settle some of the cases in between. This is perhaps the most popular view of the nature of vague language, and has been articulated, developed, and endorsed by Kit Fine, David Lewis, and many others.

So far, we have not seen much motivation for the third view of vagueness, according to which vagueness in language is a reflection of a kind of vagueness in the world. In the case of the predicate “tall woman”, the view would be something like this: the predicate expresses a property that is itself intrinsically vague. Some women definitely have the property, some women definitely do not, but there are some women in between, that neither definitely have it nor definitely lack it. The property itself, independently of us, lacks a sharp boundary, and our word, for that reason, is vague. This view seems undermotivated in this case, and seems to explain a mildly mysterious phenomenon with another, perhaps more mysterious phenomenon, whereas the linguistic view looks like it will explain the same phenomenon with something much less mysterious.

But when we turn to another sort of example of vagueness, the appeal of the metaphysical view becomes much clearer. It looks as though the boundaries of objects are often vague, in something like the way that the boundaries of the application of some predicates are vague. Consider a typical mountain. As you walk down off the mountain, which step takes you from being on the mountain to not being on the mountain? For many mountains, it looks like it is impossible to say exactly where the boundary of the mountain lies. And consider a cat who is shedding her hairs. At what point in the shedding process does a hair go from being a part of the cat to no longer being part of the cat? Or consider the absorbing and excreting of water and nutrients: at what point does a water molecule become part of the cat, and at what point does it cease to be part? Or again, consider the question of when the cat goes out of existence. Suppose it dies a natural death, so to speak. Does it die at the moment of its very last heart beat? Or at the moment of the last firing of a neuron in its nervous system? And are we sure that it will be a sharp, determinate matter when that event happens?

The idea that there are objects without sharp boundaries seems natural for a whole host of objects studied by sciences like biology, geology, and ecology. When an ecologist manages, say a wetland area, he may draw a sharp boundary for the wetland, for certain legalistic and procedural purposes, but he is apt to admit that his choice had a certain arbitrariness to it. He could have drawn the boundary a little differently, for the natural boundary of the wetland is not sharp; it just shades off into other regions around it. The matter is not completely arbitrary, of course: for some points in space, it is quite clear that they are within the wetland, and for others it is quite clear that they are not it. Nature determines that many choices for drawing the boundary would not make sense, but nature leaves it open that different sharp lines would be equally good as choices. There is a little arbitrariness, but not a lot.

And some biologists have taken the Darwinian approach to evolution to have revealed that the boundaries between species are not sharp. It takes many generations before speciation occurs, and it occurs very gradually. Some more philosophically inclined biologists, Ernst Mayr for example, have even said, noting the apparent vagueness of the species boundary, that what Darwin revealed is something that threatens classical logic.

Examples like these suggest that it lies in the nature of some complex objects that they simply do not have sharp boundaries. And this is exactly the sort of phenomenon that suggests that vagueness in language reflects a sort of vagueness in the world. Thus the vagueness of the predicate “is a part of the wetland” or “is a part of the cat” is to be explained by the metaphysical vagueness of the wetland or the cat. When we say that something lacks sharp boundaries, we really do mean to make a remark about the world, not about our language. Perhaps we can imagine a world in which mountains and animals do have sharp boundaries, but as a matter of fact it appears that we are not in such a world.

So we have seen that when we consider the vagueness of words like “heap”, and “bald”, and “is a tall woman”, it is plausible that the vagueness is just a matter of the semantics of the words, not a reflection of some deep vagueness in the world. Yet when we consider the vagueness of predicates like “is a part of the cat” or “is within the wetland”, it looks like the vagueness seems to flow from the world itself, and that our language is vague because of the nature of the objects.

Perhaps there are two different kinds of vagueness in language, one that is merely semantic, and another that flows from a worldly kind of vagueness. But let us now delve a layer deeper into the issue by considering some of the logical issues concerning vague language. The difficulties are great: logic and vagueness are like oil and water. The difficulty I will focus on is what I will call the “no sharp line problem”.

I will illustrate the issue with the predicate “is a tall woman”. The vagueness of this predicate suggests that there is no one height such that the predicate is false of all women less than that height and true of all women greater than that height. The world does not divide into two groups, the women of whom the predicate is false, and the women of whom it is true, it would seem. Now this suggests that there is a third group, the borderline cases, so to speak, of which the predicate is neither true nor false. Thus it might be that the predicate is false of women under 67 inches tall, true of women over 70 inches tall, and neither true nor false of the rest of the women.

Now when we admit truth-value gaps, questions arise about the notions of logical truth and logical consequence. Classical logic, the logic that we indoctrinate almost all philosophy students with, must be to some extent revised, for it assumes that all sentences are either true or false. There are different ways to revise bivalent classical logic, but it is not clear that any of them will give us what we need.

For we should ask, is this picture, with truth value gaps, really an improvement over the rejected picture, on which the women divide up nicely into two groups, the tall women and the non-tall women? There is a strong sense that it is not an improvement, for it presents us now with two sharp lines instead of three. There is the sharp line between the women of whom the predicate is false and the borderline cases, and another sharp line between the borderline cases and the women of whom the predicate is true. On reflection, these sharp lines seem just as repugnant to our sense of the vagueness of the predicate as the rejected single sharp line. Does this mean then that there are five classes of women then, the three already mentioned and then two more in between? That picture seems to make the sharp line problem even worse, for then there are four sharp lines that seem just as strange as the original rejected line. We are faced with problems like these no matter how the details of the logic go.

This is a logical problem, and there is a way in which it confronts both the semantic and the worldly views of vagueness. For on both of these views, the vagueness of the predicate means that there is an important sense in which the predicate does not draw a sharp line. And it is logical difficulties like these that have lead philosophers to the otherwise unintuitive epistemic theory of vagueness. If the logical difficulties of the notion of the lack of sharp line are as insuperable as they seem, we may be forced to conclude that after all, there really is a sharp line after all, and thus vagueness is just a special kind of ignorance of the location of the line. It's there, it has to be, logic tells us so, and we just don't know where it is.

There are other logical problems about vagueness, and other ways to try to get around the problem I have trotted forth here. But for now let me leave it at this: the difficulties are severe, and it is clear that the intuitive notion of a lack of sharp line is mysterious at best, and incoherent at worst. It is perhaps the sole virtue of the epistemic theory, that it avoids these logical difficulties at the outset by accepting the initial classical division of the women into two groups. This is an aspect of the depth of the problem of vagueness: it looks like we are forced to a choice between a problematic, mysterious notion of a lack of sharp line, and a problematic, mysterious notion of the presence of a classical sharp line.

But a radical version of the semantic view of vagueness might give us a way out of the present problem. Consider the idea that there simply is no way to describe the semantics of vague language from a coherent external perspective. On this view, a language that is vague is necessarily at a certain remove from the world, and it is clear that the more precise our language becomes, the closer it comes to being able to directly confront the facts in the world. Perhaps we will never be able to achieve it, but the elimination of vagueness is a necessary goal to the establishment of a language that directly gets at reality. This sort of view of vagueness was perhaps held by Frege, and has been flirted with by Dummett and other contemporary philosophers, though there reasons are not always clear.

Let's sum some things up at this point. Setting the epistemic theory aside, we have seen some points for and against the other two pictures of the nature of vagueness. While it looked natural to think that the vagueness of words like "bald" and "heap" was merely semantic, it looked like the vagueness concerning the boundaries of objects flowed from a vagueness in the world. But then when we considered the logical no sharp line problem, it appeared that a radical version of the semantic view offered a way out of sorts, by admitting that the problem had no solution, but seeing this as revealing the incoherence of vague language. So the score seems to be 2 to 1, in favor of the semantic conception.

Does the worldly conception of vagueness offer any hope for a solution to the logical no sharp line problem? It appears at first that it does not. For it is

committed to there being a genuine lack of sharp boundary in nature. And as soon as one examines the implications of this commitment, the logical problems rear their heads. For as soon as we say that there is no sharp boundary for the wetland, for example, this suggests that though there are some points that are definitely in the wetland, some points that are definitely not in the wetland, there have to be some other points, at the boundary, for which there is some sort of third status. For if there were not, then all points would either be definitely in or definitely not in. But then in what sense would there be no sharp boundary for the wetland? And yet, if there is a third status, then we can ask whether there is a sharp line between the points that are definitely in and the points with the third status. And if the answer is that there is, then it appears that the lack of sharp line just gives way to two sharp lines, and that the lack of sharp boundary is a remarkably shallow phenomenon. Indeed, it would appear that there is, in a way, a sharp boundary for the wetland after all, the line between the points definitely in it and the rest of the points. But if there is a fourth status, and some points have that status, the same sorts of question can be raised again, and so forth. In short, the logical no sharp line problems remain.

There are possible solutions to consider, and I myself have outlined and developed the formal aspects of an approach to this problem that takes the notion of indeterminacy as a primitive.

Let me give you a sketch of that picture. There are three central ideas. One is the idea that vagueness does not require a revision of classical logic, but only addition to it. Second, and associated with this, is the idea that the vagueness of a language is so deeply a part of its semantics that in explaining the semantics of the vague language, one must use vague language. Third is the idea that the special facts that vagueness causes are all expressible with the use of a sentential operator, “it is determinate that”.

To apply the approach to an example, consider the series of pairwise indistinguishable tiles, ranging from clear red to clear yellow. To express the vagueness of redness, we would say at least this, that there is at least one tile,  $x$ , such that it is not determinate that  $x$  is red and not determinate that  $x$  is not red. We can abbreviate this as “it is indeterminate whether  $x$  is red. Now of course there is the logical no sharp line problem, so we also will want to say such things as that there is a tile such that it is indeterminate whether it is indeterminate whether  $x$  is red. And we suspect that no matter how much you iterate the determinacy operator, indeterminacy at a higher level, so to speak, remains.

Further, remember that we keep classical logic, so we will say that there is in fact a pair of adjacent tiles such that the first is red and the second is not red. But we bring the determinacy operator to the rescue: there is no adjacent pair such that it is determinate that the first is red and determinate that the second is not red.

This approach is associated with a formal semantics that is a sort of vast elaboration on supervaluational semantics. Rather than give you the details, which would take a while, let me give you a very simple sketch of the formal idea and the way in which the determinacy operator must be taken to operate in the meta-language as well as the object language.

Remember that I do not reject classical logic, but only extend it. We take things in stages. At the first stage, consider an object language that is just a simple prepositional language that contains as its atomic sentences only sentences that represent the English sentences “Tile 1 is red”, “Tile 2 is red”, “Tile 3 is red”, and so forth. Since we keep classical logic, we keep the idea that there is some classical assignment of truth values to these atomic sentences that is correct, in the sense that it assigns a sentence true just in case the English sentence really is true, and false just in case the sentence really is false. So there’s nothing false in the purely classical approach. But there is something missing. And that is the thought that though there is an assignment that matches the real truth values, there is indeterminacy about what the real truth values are, and hence there is no assignment that determinately matches the real truth values. This is parallel with what we say about the tiles: there is some pair of tiles that marks the transition from red to non-red, but it is not determinate which pair it is. And there is a correct assignment, but it is not determinate which assignment it is.

At the next stage, we add a determinacy operator to the object language. Now here the semantics get quite complicated. Rather than lead you through a full description of the complexities here, let me just tell you a couple of characteristic results about the resulting logic for the determinacy operator. One is that for any sentence  $\phi$ , if  $D\phi$  is true, then so is  $\phi$  itself. This corresponds to the thought that anything that is determinately the case is indeed the case. Another is that for any classical tautology  $\phi$ , for example an instance of the law of excluded middle,  $D\phi$  is a logical truth. Not only do we preserve classical logic, we get that classical logical truths are determinate truths. A third, and important aspect of the logic is that for any sentence  $\phi$  the following is a logical truth:  $\text{NOT } D(\phi \text{ and not } D\phi)$ . This corresponds to the idea that it is never determinately the case that something is both the case and not determinately the case. This last result is important because it alleviates some of the pain of admitting that some things are the case but not determinately the case. Though that it is true, it is never determinately true, of any sentence, that it is both true and not determinately true.

Now there are many interesting details of this logic to consider, but I can tell you that in the end a certain amount of mystery remains. While I think this approach captures a very good approach to thinking about logic in a vague language, the notion of determinacy may not be intuitively solid enough, or strong enough, to bear the weight which it is called upon to bear by this approach. In fact, it may be that the best solution to the logical problems, on the metaphysical view of vagueness, is to take the notion of the lack of sharp boundary as a crucial logical

primitive. The notion of determinacy does not give us everything we need, and the notion of a lack of sharp boundary probably cannot be reduced to any notion easily expressible with the determinacy operator. If this is right, then we may have to embrace the lack of sharp boundary as a somewhat mysterious brute phenomenon of nature, something we would have to accept with natural piety, to use a phrase of the great emergentist Samuel Alexander. Its logical properties remain problematic.

So where are we then? On the one hand, we can take the vagueness of language to be an incoherent semantic phenomenon that defies coherent description from outside, respecting and amplifying our initial suspicions about “heap” and “bald” and “red”. Or we can have our vague objects, taking vagueness to be a primitive, logically mysterious phenomenon in the world that we simply have to accept as given to us by nature. Though I am myself willing to believe that nature might present us with such a thing, there is no doubt that there is a rational appeal in the idea that the logical problems of vagueness are problems that we could in principle be rid of, problems that would not arise for a language that directly gets at the world as it is in itself. Hence we might give a slight edge to the semantic view at this point.

But we must now consider what the world would have to be like if indeed vagueness is merely a semantic phenomenon. We will see that on the most straightforward way of looking at the world as containing no vagueness, we get a world that is actually quite alien.

David Lewis and other philosophers who have held the semantic conception of vagueness have painted pictures of the non-vague world that are clear enough, but to my mind unacceptable. In outline, the pictures tell us that the world contains a myriad of objects, many more than we ordinarily recognize, all on a metaphysical par, each of which is perfectly precise. To illustrate, let me make some simplifying assumptions. We will assume that there is some class of absolutely fundamental physical object, objects which have no parts in any interesting sense. We will call these “atoms”. The universe contains a lot of atoms, and these atoms obey some strict causal laws. Now every other object that there is is what we call a “fusion” of atoms. The notion of a fusion is the notion of a mereological sum, a notion clarified and axiomatized originally by the Polish logician Lesniewsky. We needn’t worry about the details of the axiomatization now; what matters for us is this: for every set of atoms, there is exactly one fusion of the atoms in the set. Every atom is a part of the fusion, and no other atoms are part of the fusion.

The ontology of atoms and fusions of atoms is non-vague in the following sense: there is no vagueness at all about whether something is part of something. Atoms have no parts, and whether an atom is part of a fusion is never vague. And one fusion is part of another fusion just in case all the atoms that are parts of the first fusion are parts of the second.

Fusions seem to be pretty strange things at first. Setting vagueness aside for a moment, suppose that a cat is a fusion of atoms. Then there is another object whose atoms are all the atoms in the cat, plus the atoms in the Eiffel tower. Indeed, that object is the fusion of the cat with the Eiffel tower. It is a weird object, not one that you would ordinarily notice. But it is there, just as much a real object as the cat is. And there is another fusion, which we might call, the left half of the cat, whose atoms are the atoms that are within the left side of the cat. And there is something we might call the “front 38% of the cat” as well. There is the fusion of all of the pasta that currently resides in the digestive tracts of people whose last names begin either with “T” or “S”. And so forth. All of these weird things exist, even though we don’t have names for them and don’t think about them very much. And they are all on an ontological par: they are all just fusions of atoms.

Now if we did not have any reason to think that a cat, for example, has vague boundaries, then we could identify the cat with a fusion of atoms. But to the extent that it is vague whether a given water molecule is part of the cat, we cannot identify the cat with a fusion. Supposing, for simplicity, that there is only one questionable water molecule, that the cat’s boundaries are otherwise completely precise, there would be two fusions that are equally good candidates to be counted as the cat: a fusion that includes the molecule and all the atoms that are definitely part of the cat, and another fusion that does not include the molecule, but does contain all the atoms that are definitely parts of the cat. Call these fusions “cat plus” and “cat minus”. Now, according to our ontology, there is no one thing that can be singled out as the cat; there are cat plus and cat minus. Since vagueness is some kind of semantic feature of language, we can say that the name of the cat, “Tibbles”, say, does not actually refer to cat plus, nor to cat minus. Perhaps it is a result of indecision: we just have not decided what the name is to refer to; we have not chosen between cat-plus and cat-minus.

Now if that is the case, then whenever we are inclined to say that there is an object without sharp boundaries, the ontology of fusions gives us a host of slightly different fusions, all of which have precise boundaries that lie, as we might say, more or less where the vague boundary of the vague object is. But this is just a manner of speaking, for there is not really any vague object there at all: all there are are lots of fusions.

Philosophers who have believed in the ontology of fusions have attempted to interpret the vague language that seems to refer to vague objects within the entirely non-vague ontology of fusions. The main idea, very roughly, is that a name like “Paul Hovda” which we are tempted to say refers to a vague object, vague because his boundaries are vague, so to speak, does not refer to any one fusion, but instead is semantically tied to a bunch of fusions. And anything we say when we use the name in a simple subject-predicate sentence is true or false according to whether all of the fusions tied to the name have the property

expressed by the predicate. Thus “Hovda is sitting” will come out false, since all of the fusions are not sitting, “Hovda is standing” will be true, since all of the fusions are standing. And if there is a water molecule,  $x$ , about which there is vagueness whether it is part of Hovda, then “ $x$  is part of Hovda” will be neither true nor false, because  $x$  will be part of some, but not all, of the fusions tied to the name.

This interpretation of the vague language answers to many of the things we want to say, but there are at least two difficulties with it. First, as I hope you have coming, there are variations of the logical no sharp line problem. Exactly which fusions are tied to the name? Doesn't this interpretation tell us that there is definitely exactly one fusion, which we might call “minimal Hovda”, which contains all and only the atoms that are within every fusion that is tied to the name? And then there will be maximal Hovda as well. But isn't the sharp line here just as implausible as the sharp line between parts of Hovda and non-parts of Hovda? And isn't it strange that I could easily make my language precise by declaring that from here forward, I will mean by the name “Hovda” maximal-Hovda, and in general, will refer to the maximal fusions corresponding to all of the names in my vague language? If we all did this, we would get rid of vagueness once and for all, it would seem. There are of course responses to this, but the obvious ones seem to be hopeless epicycles, not real solutions. There may be no coherent, systematic way to describe the relationship of vague language to the precise world.

But there is a second problem, actually far worse, I believe, than the logical no sharp boundary problem. And that is this: in the fusion ontology, there are lots and lots of things talking to you right now, all of the various fusions tied to the name Hovda. I thought I slept alone last night, but it turns out that really there were thousands of human beings in my bed last night. Either that, or none of the fusions is really a human being. In that case, I guess that no humans slept in my bed last night, and I don't even exist. Let me note here that the philosopher Peter Unger thought that he could argue for his own non-existence on more or less these lines.

Thus the proliferation of things offered by the fusion ontology is extremely unintuitive. The world of precise objects that it offers is hopelessly alien. I cannot see myself in it, for either there are really many of me, or none of me, and neither option is consistent with my picture of myself. And so it goes for any objects that we would want to say have vague boundaries. They all give way to proliferations of fusions, and thus they wash away.

So I argue that the fusion ontology gives us a world which, despite its logical clarity, is a radical departure from the world we take there to be. Now perhaps there are good answers to these charges; the charges have occurred to the philosophers attracted to the fusion ontology, and they have tried to deal with them. For my part, I am not satisfied with their answers: some obviously bite the

bullet, and admit, as Unger does, that virtually none of the things that we ordinarily believe in, and virtually none of the objects of any of the sciences besides the most fundamental physics really exist. Others try to cover up the weirdness by interpreting our talk of ordinary things within the fusion of ontology; but even when we set aside the logical difficulties connected with their efforts, the interpretation, from a philosophical point of view, feels to be a cover-up or a cheat, something like a way of interpreting the beliefs of one religion in terms of the ontology of another one.

Autobiographically, these observations about the fusion ontology have led me away from it and straight into the heart of darkness, so to speak, for they have led me to return to the idea of intrinsically vague objects, and to a position where I am ready to accept, with natural piety, so to speak, as a mystery of nature, so to speak, that some objects just have vague boundaries and that’s the end of it. The logical difficulties which confront this point of view will have to be dealt with somehow, but there again there may have to be some mystery swallowed.

Now at this point the battle for our belief between the semantic conception of vagueness and the metaphysical conception might be thought to turn on unexplainable philosophical intuitions about which of two sorts of mystery or weirdness is the worse. It feels like a difference of religion, the sort of difference that might lead you to think that the issue is somehow a pseudo-issue, or at any rate, one that is hopelessly beyond our really settling, about which there will be little real argument, but a lot of rhetorical noise. I say, “there are vague objects, that’s the way it is, see, there’s one right there”, and my opponent says “there can’t be vague objects, its incoherent” and we both say the same things louder and louder. Innocent bystanders won’t get any philosophical insight; in fact they might get hurt.

So is that the end of it then? No. For there is a path we have not yet considered.

It is not the epistemic path, which is redolent of its own peculiar odor of mystery. It is a path whose direction can be glimpsed by considering a different approach to accommodating the notion of vague objects. When we considered before what it would be like for the world to contain no intrinsic vagueness, we went straight to the fusion ontology. There was an assumption there that you may not have noticed. That was this: if vagueness is merely in the language, and not in the world, then there is vagueness in the name of an object with vague boundaries. There is another possibility: the vagueness may lie entirely in the relational notion of one thing’s being a part of another.

In the fusion ontology, it is never vague whether one thing is part of another. The fusion ontology, in effect, takes parthood to be precise, at least as it applies to the objects that there really are. But what if we, on behalf of the semantic conception of vagueness, locate the notion of part as the center of the

vagueness, and yet retain the objects that we initially would say do not have vague boundaries?

This suggests a path that is, so far as I know, fairly little traveled. David Lewis explicitly says that there is nothing vague in the notion of part, and that may be part of what drives him to a fusion ontology.

Here are some first steps down the path. Consider me and the water-molecule again. In the fusion ontology, there are the two fusions, Hovda plus and Hovda minus, one object which includes the water molecule and the other which does not. In the ontology of intrinsically vague objects, the water molecule seems to have a problematic status: not definitely a part, not definitely not a part. But suppose a biologist is asked whether the molecule is part of me or not. His actual answer may be something like this:

“well, the molecule is currently within an absorption pump on the membrane of an epithelial cell in the large intestine. I can tell you a lot of things about what functions the molecule will serve within the body, and I can tell you that right now it is, pretty much, though maybe not entirely, within a sort of store-house, and in a loose sense might be said to already be functioning as a supply to be utilized according to the needs of cells elsewhere in the body. Whether you want to call that a part or not is an arbitrary choice. I might lean toward saying that it isn’t yet a part, but I can’t really give you a decisive reason for that, and I can see that there will be instants at which I really won’t have a leaning one way or the other. But why does it matter? After all, I can tell you at each stage, in relation to the functioning of the whole organism, lots of things about the relation of the molecule to the whole. And aren’t these the interesting facts?”

This answer is in a way analogous to the sorts of answers sensible people will give to questions you might ask about things associated with the sorites paradoxes. “Is this tile red or not”? Well, it is sort-of red; maroon, I would say. Is he bald or not? Well, there is a fairly significant area on the top of his head that is very thin of hair; from certain angles he strikes me as bald, but from others he doesn’t.

These sorts of answers do not answer the question asked by giving a yes or a no, even though they are grammatically suited to be answered that way. Instead, they answer the question by describing the situation asked about using a different vocabulary than that used in the question. In some cases, the shift in vocabulary seems to be a shift toward more specific, one might even say more precise, vocabulary. When we say that something is maroon, and avoid a direct characterization of the thing as red or non-red, we have descended to a vocabulary that is more suitable for the issue at hand.

It is surprising that this phenomenon, the descent to a lower level of description, we might call it, is virtually ignored in the literature on vagueness. For it seems to be quite relevant.

For today, the lesson I want to draw from it regards the question of objects without sharp boundaries. Returning to the problematic water molecule, we see that a biologist can tell us important things about the connection of the water molecule to the organism as a whole without characterizing it either as a part or not a part. Now if a world free of intrinsic vagueness is to include me and the water molecule, could it not be that the vagueness is to be located, after all, just in the notion of part?

The fusion ontology did not give us as a satisfying picture of a world free of vagueness. What replaces that ontology, if we locate vagueness in the notion of part? This is not easy to answer, but a few suggestive remarks can be made. To make them, let us suppose, for simplicity, that there are indeed some absolutely basic objects, atoms, whose existence is taken for granted. Now how should we conceive of the higher-level objects that we want to say have vague boundaries, those that seem to be composed of the atoms?

Not as simple fusions. Instead, what we will have, among other things, are objects which “emerge”, so to speak, as causally and functionally unified patterns in the vast sea of atoms. Whether an object is part of one of these objects is a matter which turns on the way and extent to which the putative part is integrated into the pattern. At some times, the water molecule is completely outside of all of my life functions, not integrated at all into their intricate play. But at some times, it is directly functioning in some life activity. At others, in between, its relation to me is more tenuous, yet close enough that we hesitate over the question whether it is a part of me.

These functionally and causally unified patterns in the atoms need not be “emergent” in the sense that their behavior is completely independent of the basic laws that govern the behavior of atoms. The facts about complex objects may well “supervene” on the facts about atoms, in the weak sense in which variation in facts about complexes requires variation in facts about atoms. Same total arrangement of atoms in world-history, same total facts about complexes. Further, it may be that facts about atoms are crucial to the explanation of facts about complexes. We need not abandon the basic conviction of physicalism that most of us have; but we must be careful not to express physicalism in a way that leaves out the higher-level objects. And this means thinking of the part-whole relation in a different way than that offered by the fusion ontology. Thus we will have to reject many of the formulations of physicalism that philosophers have offered.

The idea is that the part-whole relation is itself vague, and is underlain by more precise facts to which we can give expression, facts that express the role of one

object in the functioning of, or causal facts about another. This idea applies naturally to many examples.

The picture which is beginning to emerge here is one on which the lack of sharp boundary of an object is to be accounted for in part as a consequence of the objects functional and causal complexity. Things as functionally complex as a human being are bound to bear such various relations to the bits of matter around and within them that drawing a line between part and non-part will involve a certain arbitrariness.

Now I have only given a hint here of how to think of the ontology of composites in a world of atoms that create complex higher-level patterns of cause and function. I will not attempt to fill it in any more. But I will close with a few remarks about where we have come.

First, I want to note that a metaphysical idea has emerged from our study of vagueness that seems to be somewhat independent of the issues of vagueness. That is the idea that being a part of a thing is not a brute matter, as it would be with the fusion ontology. On that ontology, whether a thing is part of another is a brute fact, just like whether a thing is a member of a given set. There is no explanation of why a given object is a member of a set. The number three is not a member of the set of odd numbers because it is odd. Not at all; of course when we designate that set as the set of odd numbers, we might get the feeling that three is a member of it just because it meets the condition we used in the designation. But the same set can be designated in indefinitely many ways, and none of them are privileged. What is essential to the set is just its extension, and something's being in that extension is not a result of its meeting those designations.

The fusion ontology then, is not just an ontology; it is the embodiment of a mistaken conception of part-hood. Things can be parts of things for reasons; in the cases we have looked at, parts are parts because of the way they contribute to the functioning or activity of the thing.

Second, what about the question whether vagueness is in the world or only in the language? Which way have I suggested we go on that? Well, it looks as though the current picture could locate vagueness in the language only. Yet it embraces the idea that as a matter of apparently contingent, empirical fact, there are objects so complex that the notion of parthood calls for a certain amount of arbitrary sharpening. There may be objects for which this is not the case, and if so, there is a contrast to be drawn, and it is tempting to call this the contrast between objects that have sharp boundaries and objects that don't. And that feels a lot like saying that there are vague objects. At the deepest level of metaphysics, there may be no vagueness in the world, but I do not take myself to have shown that. But if the logical problems of vagueness force us to give up on the coherence of the thesis of an intrinsically vague world, we still need not

eliminate single human beings and other apparently vague objects from the ultimate ontology of the world.

Third, what about the logical difficulties about the lack of sharp line? I have suggested that there is an approach to the logic of vagueness that helps to cope, the logic involving the determinacy operator. Yet it is not as satisfying as we might wish. Now if vagueness is in the language and not ultimately in the world, then we can take the hard line and say that vague language is logically incoherent, and thus ignore the logical difficulties. Yet even if this is so, we speak a vague language, and it would be nice to have as coherent as possible an account of it.

But recall the observation that in the face of questions like “Is this red?” we sometimes wish to descend to a lower level of description when we answer the question. Does this suggest that there are three categories of things, the ones about which we would happily answer “yes”, the ones about which we would happily answer “no”, and the rest of the things? And if so, are there sharp lines between these three categories, or are there further categories, or what? My last remark is a pure speculation about this matter: when we focus on the descent to a lower level of description we may not get a direct answer to the logical difficulties, but we might get something like a logical reason not to worry about them.