

# Contradictions at the borders\*

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## 1 The issue

The purpose of this essay is to shed some light on a certain type of sentence, which I call a *borderline contradiction*. A borderline contradiction is a sentence of the form  $Fa \wedge \neg Fa$ , for some vague predicate  $F$  and some borderline case  $a$  of  $F$ , or a sentence equivalent to such a sentence. For example, if Jackie is a borderline case of ‘rich’, then ‘Jackie is rich and Jackie isn’t rich’ is a borderline contradiction. Many theories of vague language have entailments about borderline contradictions; correctly describing the behavior of borderline contradictions is one of the many tasks facing anyone offering a theory of vague language.

Here, I first briefly review claims made by various theorists about these borderline contradictions, attempting to draw out some predictions about the behavior of ordinary speakers. Second, I present an experiment intended to gather relevant data about the behavior of ordinary speakers. Finally, I discuss the experimental results in light of several different theories of vagueness, to see what explanations are available. My conclusions are necessarily tentative; I do not attempt to use the present experiment to demonstrate that any single theory is incontrovertibly true. Rather, I try to sketch the auxiliary hypotheses that would need to be conjoined to several extant theories of vague language to predict the present result, and offer some considerations regarding the plausibility of these various hypotheses. In the end, I conclude that two of the theories I consider are better-positioned to account for the observed data than are the others. But the field of logically-informed research on people’s actual responses to vague predicates is young; surely as more data come in we will learn a great deal more about which (if any) of these theories best accounts for the behavior of ordinary speakers.

### 1.1 Contradictions and borderline cases

In (Ripley, 2013), I defend a theory of vague language based on the paraconsistent logic LP.<sup>1</sup> LP can be thought of as a three-valued logic; it is dual to Strong

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\*Published as (Ripley, 2011).

<sup>1</sup>LP is so christened in (Priest, 1979).

Kleene logic, which has been recommended as a logic for vague language by eg Soames (1998) and Tye (1994). If we use the numbers 1, .5 and 0 as the three values, then we can assign each atomic sentence  $A$  a value  $\nu(A)$ , and calculate the values of compound sentences as follows:

- $\nu(\neg A) = 1 - \nu(A)$
- $\nu(A \wedge B) = \min(\nu(A), \nu(B))$
- $\nu(A \vee B) = \max(\nu(A), \nu(B))$

It follows from these clauses that when  $A$  takes value .5, so too will  $A \wedge \neg A$ . But what do the values *mean*? We can, as usual, take the value 1 to represent truth and 0 to represent falsity. When it comes to the value .5, LP and Strong Kleene logic differ from each other. The Strong Kleene theorist reads .5 as a *gappy* value—one taken by sentences that are neither true nor false. Since such sentences aren't true, they aren't to be asserted, and they aren't part of the Strong Kleene theorist's theory. On the other hand, the LP theorist reads .5 as a *glutty* value—one taken by sentences that are *both* true and false. Since such sentences are true, they are to be asserted, and they are part of the LP theorist's theory.

An LP-based theory of vagueness uses this middle value for borderline cases. That is, where Egbert is a borderline case of 'old', the sentence 'Egbert is old' receives value .5. As above, this ensures that the sentence 'Egbert is old and Egbert isn't old' also receives the value .5. Since sentences with the value .5 are true, this theory predicts borderline contradictions to be true (it predicts them to be false as well). For similar reasons, whenever  $a$  is a borderline case of a vague predicate  $F$ , I claim that ' $a$  is  $F$  and  $a$  is not  $F$ ' is true. Similarly, I claim that ' $a$  is neither  $F$  nor not  $F$ ' is true as well, since this follows from the former by a single De Morgan law plus an application of a double-negation rule, both of which are valid in LP. This is a dialetheist theory, since it takes some contradictions to be true.

Other theorists, of various stripes, have not been so sanguine about the truth of borderline contradictions. A few quick examples: Fine (1975) dismisses the idea in a single sentence—"Surely  $P \wedge \neg P$  is false even though  $P$  is indefinite".<sup>2</sup> Williamson's (1994) much-discussed argument against denials of bivalence works by arguing the denier to a contradiction; assuming the denial of bivalence was initially made about a borderline case, this contradiction will itself be a borderline contradiction. If Williamson thinks this is a dialectically strong argument, as he gives every indication of, borderline contradictions had better not be true. Keefe (2000) offers: "many philosophers would soon discount the paraconsistent option (almost) regardless of how well it treats vagueness, on the grounds of . . . the absurdity of  $p$  and  $\neg p$  both being true for many instances of  $p$ ". And Shapiro (2006) claims, "That is, even if one can competently assert  $Bh$  and one can competently assert its negation, one cannot competently contradict oneself

<sup>2</sup>Notation changed slightly; note that Fine is here treating borderline cases as "indefinite".

(dialetheism notwithstanding).”<sup>3</sup> None of these rejections of borderline contradictions offers much in the way of argument; it’s simply taken to be obvious that borderline contradictions are never true, presumably since no contradictions are ever true.<sup>4</sup>

Not all theorists—not even all non-dialetheist theorists—have been so quick with borderline contradictions, though. For example, fuzzy theorists allow for borderline contradictions to be partially (up to half) true.<sup>5</sup> Let’s see how. The usual way of doing things assigns each sentence  $A$  a real-number truth value  $\nu(A)$  from 0 to 1, inclusive. Then, the values of compound sentences are determined truth-functionally from the values of their components, according to the same clauses given above for LP. It follows from this that a contradiction (conjunction of a sentence with its own negation) can take a value as high as .5. It takes this maximum value when its conjuncts themselves each take value .5—right in the middle of a vague predicate’s borderline. A fuzzy theorist interprets the value .5 as a degree of partial truth, in particular as half truth, so a fuzzy theorist predicts borderline contradictions to be at least partially true, as much as half true. This prediction is often held up as a liability of fuzzy theories; see for example (Williamson, 1994).

## 1.2 Predictions about ordinary speakers

Smith (2008, pp. 252–253) lists ten sorts of sentence for which we don’t as yet have clear empirical data about speakers’ intuitions; he resists making many predictions about speakers’ intuitions pending the data. At least three of his categories are borderline contradictions, in my sense, and he’s right: there isn’t much data on speakers’ responses to them.

Some experimenters have taken brief looks at ordinary speakers’ intuitions surrounding vague predicates (for example Bonini et al. (1999)), but these have primarily looked at atomic sentences, whereas the crucial action for theories of borderline contradictions is clearly in compound sentences; empirical work here is still in its infancy.<sup>6</sup>

Few logically-minded theorists of vagueness, then, have bothered being very explicit about what their theories predict about ordinary speakers. This does not mean, however, that there is no relation between these logical theories and

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<sup>3</sup>Since, for Shapiro, the relevant cases in which one might competently assert  $Bh$  and competently assert its negation are all cases where  $h$  is a borderline case of  $B$ , this is a rejection of borderline contradictions.

<sup>4</sup>Williamson might claim to have an argument for his rejection of borderline contradictions: his defense of classical logic on grounds of its simplicity. Note, though, that that defense is dialectically out of line in the midst of the argument Williamson gives against denials of bivalence; why bother arguing the bivalence-denier to a contradiction, and then appeal to the truth of classical logic to reject the contradiction, when you could simply appeal to the truth of classical logic directly to counter a denial of bivalence? Presumably, Williamson thinks the rejection of borderline contradictions is dialectically more secure than his defense of the full apparatus of classical logic.

<sup>5</sup>At least the usual sort of fuzzy theorists do. See for example (Smith, 2008).

<sup>6</sup>Since this paper was prepared, a few other studies have appeared that explore compound sentences like those considered here: (Alxatib and Pelletier, 2011) and (Serchuk et al., 2011).

experimental data. We have supervaluationist and contextualist and fuzzy theories of vagueness, and we can take these theories to be formal semantic theories, answerable to speaker intuitions in just the same way that other semantic theories—about gradable adjectives, or quantifier inferences, say—are.

It may well be, of course, that some theorists don't intend for their logical theories to be interpreted in this way. They might be offering hypotheses, for example, about the structure of reality itself, independent of how we talk about it; or they might be offering hypotheses about how we *ought* to use our language, rather than about how we *do*. These are worthy questions in their own right, but I won't explore them here. Rather, I'll present an experiment and weigh various possible explanations for the result; as such, the goal here is to consider various hypotheses about how speakers actually use vague language.

These hypotheses are best understood, I think, as theories of speakers' linguistic competence, and there is of course much more to participant responses than simply their competence; any number of performance factors may intervene. While there is no direct inference to be made from data about participants' responses to conclusions about their competence, the two are still related. The connection is provided by theories of the intervening performance factors. Given data  $x$ , we can compare theories of competence  $y$  and  $z$  by seeing what theories of performance would need to be conjoined to them, respectively, to explain  $x$ . If we find that  $y$  needs an odd story about performance factors to explain  $x$ , while  $z$  can explain  $x$  when conjoined with a natural (ideally, an independently-motivated) theory of performance, then this gives us some reason to favor  $y$  over  $z$ .

As we've seen above, different logical theories accord different status to borderline contradictions—some predict them to be fully true, some predict them to be at best half-true, and some predict them to never be true at all. I'll present and consider some evidence about which of these predictions seems to accord best with speakers' intuitions. Where predictions seem to come apart from participants' intuitions, I'll consider various performance-based explanations that might be offered.

## 2 The experiment

To explore intuitions about contradictions in borderline cases of vague predicates, I conducted an experiment. Participants were 149 undergraduate students at the University of North Carolina.<sup>7</sup> They saw a slide (projected onto a screen) with seven circle/square pairs on it, labeled 'Pair A' to 'Pair G'. In Pair A, at the very top of the slide, the circle was as far from the square as it could be, while in Pair G, at the very bottom of the slide, the circle was touching the square. In between, the remaining five pairs moved the circle bit-by-bit closer to the square. (See Figure 1 on page 5.)

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<sup>7</sup>No demographic information was collected. All students were within the first month of introductory-level non-logic philosophy courses; it would be odd but possible for some of them to have taken other philosophy courses (including logic) in the past.

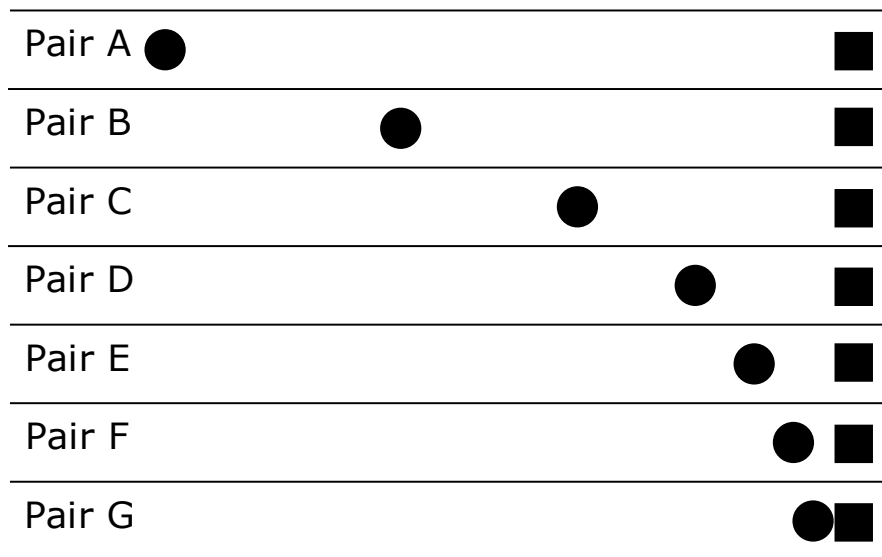


Figure 1: Experimental Stimulus

It’s difficult to tell exactly what’s a borderline case of ‘near the square’; as many authors have pointed out, the extension of vague predicates like ‘near’ is quite context-dependent, and it can be difficult to tell where the borderline is. For example, if we’re discussing distances between cities, this provides a context in which the circle is near the square in *every* pair; the distance in the farthest pair is never more than the size of the screen being used, which is surely smaller than the distance between even the closest cities. Nevertheless, I take it that the context provided by this experiment is one in which: in Pair A, the circle is a clear countercase of ‘near the square’ (that is, it is clearly not near the square—after all, it’s as far away from the square as can be projected on the screen), and in Pair G, the circle is a clear case of ‘near the square’. Somewhere in between are the borderline cases.

Participants were randomly assigned to one of four conditions. In each condition, participants were asked to indicate their amount of agreement with a particular sentence as applied to each of the seven circle/square pairs. The four conditions involved four different sentences; each participant, then, saw only one sentence and rated it seven times, once for each pair. Ratings were on a scale from 1 to 7, with 1 labeled ‘Disagree’ and 7 labeled ‘Agree’.<sup>8</sup> The four sentences were:

**Conjunction, Non-elided:** The circle is near the square and it isn’t near the square.

<sup>8</sup>As will emerge in §3.4, offering participants a range of responses is crucial to evaluate how well fuzzy theories describe participants’ responses.

**Conjunction, Elided:** The circle both is and isn't near the square.

**Disjunction, Non-elided:** The circle neither is near the square nor isn't near the square.

**Disjunction, Elided:** The circle neither is nor isn't near the square.

I'll discuss the difference between the elided and non-elided cases later. For now, note that each of these sentences has the form of a contradiction. The conjunctions wear their contradictoriness on their faces, while the disjunctions are a bit disguised; but one application of a De Morgan law reveals them to be contradictions as well.

## 2.1 Agreement to contradictions

The mean responses to each pair formed a hump pattern: higher in the middle than at the ends. This is true overall, and it's also true of each of the four conditions (see Figure 2 on page 7). The highest overall mean occurred in response to Pair C; there the mean response was 4.1, slightly above the midpoint of the 1 to 7 scale. In other words, participants exhibit higher levels of agreement to these apparent contradictions when they are about borderline cases; they do not reject what appear to be borderline contradictions. They seem to make it to at least ambivalence. In fact, they go considerably further. The means are as low as they are because the participants do not agree amongst themselves as to which stimulus should receive the highest response. If we forget about *where* the highest responses occur, and look only at *how high* each participant's highest response is (see Figure 3 on page 7), we see that the modal maximum response is 7—full agreement—and that the majority of participants offer a maximum response of either 6 or 7.

Similar results are reported in (Alxatib and Pelletier, 2011); they do not measure degree of agreement, but also record agreement with apparent contradictions in borderline cases.

## 2.2 Response Types

Over 90% of participants gave responses that fall into one of four groups. I'll call these groups *flat*, *hump*, *slope up*, and *slope down*. Here are the defining characteristics of these groups (see Figure 4 on page 8 for frequencies):

**Flat:** A *flat* response gives the same number for every question. (24 participants)

**Hump:** A *hump* response is not a flat response or a slope response, and it has a peak somewhere between the first and last question; before the peak, responses never go down from question to question (although they may go up or remain the same), and after the peak, responses never go up from question to question (although they may go down or stay the same). (76 participants)

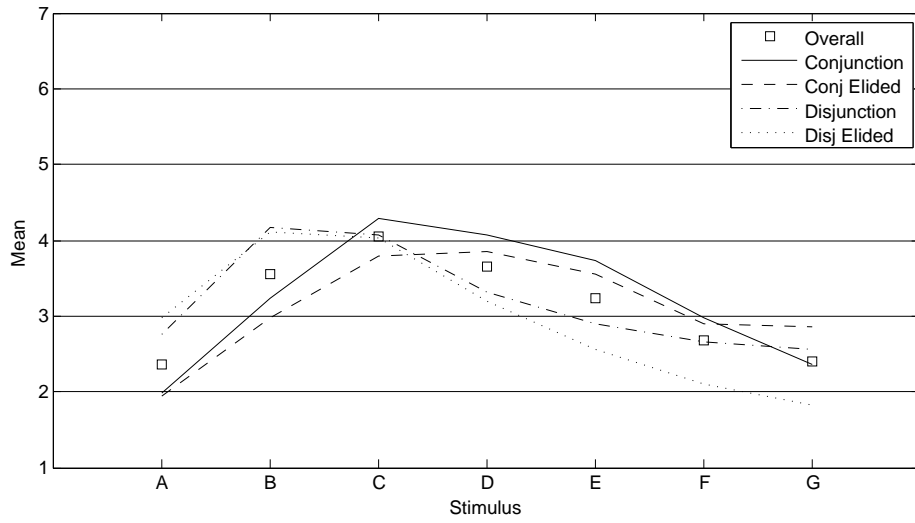


Figure 2: Mean responses

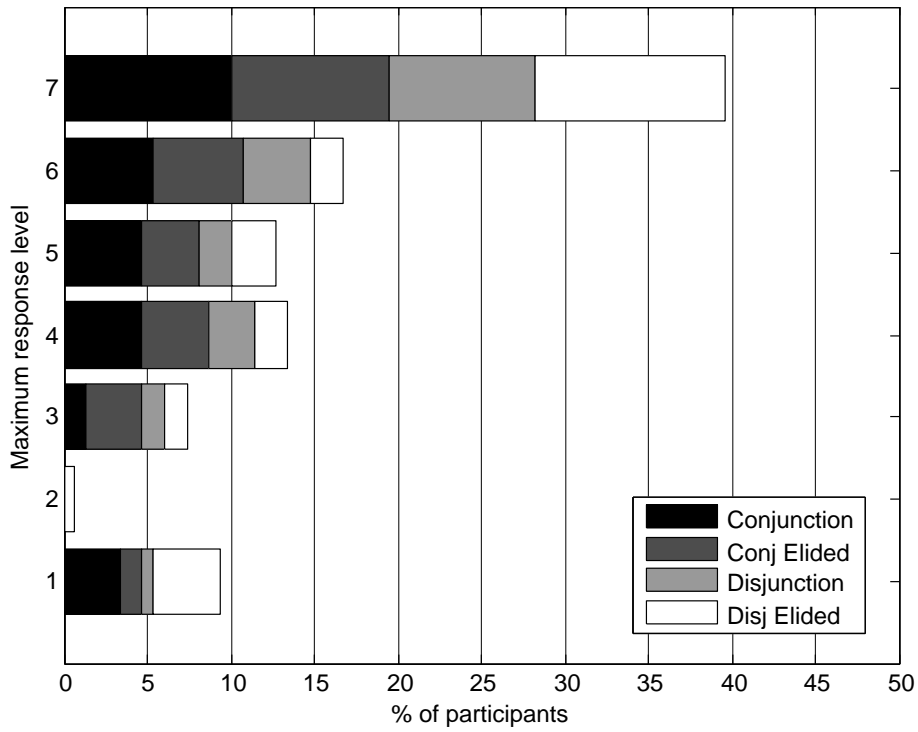


Figure 3: Maximum responses

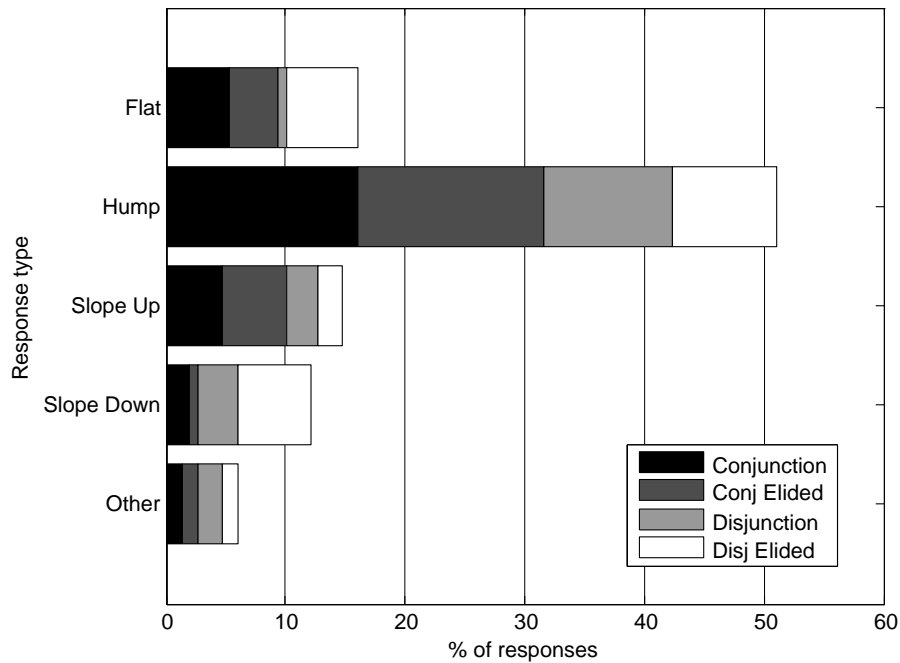


Figure 4: Response type frequencies

**Slope up:** A slope up response is not a flat response, and it never goes down from question to question (although it may go up or stay the same). (22 participants)

**Slope down:** A slope down response is not a flat response, and it never goes up from question to question (although it may go down or stay the same). (18 participants)

**Other:** There were a few responses that didn't fit any of these patterns. (9 participants)

Flat responses, in particular flat 1s (14 participants), look like the sort of response that would be predicted by all those theorists who hold that no contradiction is ever true, even a bit, even in borderline cases. But the majority of responses (76/149 participants) were hump responses.

The discussion that follows in §3 will consider various explanations for participants' agreement, partial or full, with these sentences. I'll focus discussion on the relatively large number of hump responses; a fuller discussion would consider potential explanations for the flat and slope groups as well.<sup>9</sup>

<sup>9</sup>Question type (conjunction vs. disjunction) had a significant effect on response type ( $\chi^2(4, N = 149) = 11.27, p < .05$ ). However, this effect disappeared when the two slope response types were lumped together ( $\chi^2(3, N = 149) = 2.76, p = .43$ ). Slope up responses



### 3 Interpretations

It seems at first blush that we have substantial numbers of participants agreeing, at least somewhat, with borderline contradictions of various sorts. As in §1.1, however, theorists of varying stripes have not only claimed, but taken it to be obvious, that borderline contradictions can never be true. If those theorists are right, then participants in the present study either 1) were not really agreeing with contradictions, but rather with something else, or 2) were really agreeing with contradictions, but were mistaken in doing so. In this section, I’ll consider a variety of potential explanations along these lines for the observed results. I’ll also consider potential explanations of a third sort: those that hold that participant were really agreeing with contradictions, and that they agree because those contradictions are (partially or wholly) true. In the end, I’ll argue that two potential explanations—one of the first type and one of the third type—are better positioned to explain the data than are the others.

#### 3.1 Contextual factors

This explanation falls into the “not really a contradiction” category.

Here’s one way to explain the relatively high levels of assent to sentences like ‘The circle is near the square and it isn’t near the square’ and ‘The circle neither is near the square nor isn’t near the square’: participants take the phrase ‘near the square’ to have subtly different extensions in each of its two occurrences within the sentence. If this is so, their assent to these sentences can be explained without supposing that any participants agree to a contradiction. (For my purposes here, a “contextualist” is not someone who offers any particular theory of vagueness, but rather anyone who thinks that the hump responses in the present experiment are to explained by appealing to contextual shift in the extension of ‘near the square’.)

Such a contextualist theory can come in one of two flavors: it might hold that ‘near the square’ has these different extensions because it has different contents in each of its uses, or it might hold that ‘near the square’ has the same content in each of its uses, but that nonetheless it has different extensions in different contexts. Following (MacFarlane, 2009), I’ll call the first flavor ‘indexical contextualism’ and the second ‘nonindexical contextualism’. I discuss each in turn.<sup>10</sup>

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occurred more in response to conjunctions, and slope down responses in response to disjunctions. This makes it seem as though the slope responders tended to ignore the second conjunct in each case, treating ‘both near and not’ as ‘near’ and ‘neither near nor not’ as ‘not near’. More study would be needed to definitively interpret the slope responses.

<sup>10</sup>Besides the difference between indexical and nonindexical contextualism, there is another difference in the area: the difference between theories that posit sensitivity to context-of-use (sometimes called “contextualist”) and theories that posit sensitivity to context-of-assessment (sometimes called “relativist”). I’ll ignore that distinction; for my purposes here, I’m happy to lump the relativists in with the contextualists.

### 3.1.1 Indexical contextualism

Indexical contextualism about vague terms is defended in (Soames, 2002). On this theory, different uses of vague terms can express different properties. This shiftiness is understood as the very same shiftiness exhibited by such indexical expressions as ‘here’, ‘now’, ‘you’, ‘tomorrow’, &c. For example, let’s focus on ‘you’. ‘You’, let’s suppose, picks out a certain person: the person being addressed when it’s uttered. Now, imagine someone uttering the following sentence: ‘Mona sees you, and Louie sees you’. It should be clear that the two occurrences of ‘you’ in such an utterance might pick out different people; just imagine the context changing in the right way (that is, so that the first half of the sentence is addressed to someone different than the second half).

On an indexical contextualist theory, something just like this might be happening in the sentence ‘The circle is near the square and not near the square’; the first occurrence of ‘near the square’ can pick out one property, and the second some other property. For this to be the case there would have to be some relevant shift in context between the two occurrences, and the indexical contextualist would have to provide some story about what the relevant context is and why it shifts.<sup>11</sup> Even with such a story in hand, though, the indexical contextualist runs into some difficulties with the experimental data.

The difficulty arises with the elided sentences: ‘The circle both is and isn’t near the square’ and ‘The circle neither is nor isn’t near the square’. Each of these sentences contains only one occurrence of ‘near the square’. It’s clear, though, that indexicals, in these circumstances, can have only a single interpretation. Compare our earlier ‘Mona sees you, and Louie sees you’ to ‘Mona sees you, and Louie does too’. Even with the same shift in context (that is, with the second half of the sentence addressed to someone different than the first half), the second sentence *must* report that Mona and Louie see the very same person. Since there’s only one occurrence of ‘you’, it can only pick out one person.<sup>12</sup>

Thus, the indexical contextualist should predict that, although participants might agree to the non-elided sentences, they should not agree to the elided sentences, since the mechanism invoked to explain participants’ agreement in

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<sup>11</sup>This requirement is not unique to the indexical contextualist; every contextualist needs such a story. I won’t be concerned with the details of such stories here—see for example (Raffman, 1996), (Shapiro, 2006), or (Soames, 1998). (NB: Raffman and Shapiro are not indexical contextualists.)

<sup>12</sup>Similar phenomena arise around (at least) demonstratives, definite descriptions, and proper names. In each of the following pairs, the first member allows a shift where the second does not:

- \* Mary’s buying that, unless Murray buys that  
\* Mary’s buying that, unless Murray does
- \* Put your bag on the table, and your books on the table  
\* Put your bag on the table, and your books too
- \* Esmerelda went to the store, and Esmerelda bought some fish  
\* Esmerelda went to the store and bought some fish

the non-elided cases can't operate in the elided cases. Participants simply should not agree with elided sentences. At the very least, they should agree less than they do with the non-elided sentences. This prediction is not borne out. If we consider each participants' maximum level of agreement, there is no significant difference between responses to elided and non-elided sentences.<sup>13</sup> Nor is there a difference in response types (flat, hump, &c.) between elided and non-elided cases.<sup>14</sup> If participants' agreement to these apparent contradictions, then, is to be explained by appealing to context, that context can't be operating in the way that context operates on indexicals.<sup>15</sup>

### 3.1.2 Nonindexical contextualism

Is there another way, then, for context to come into play? The nonindexical contextualist thinks so. I think nonindexical contextualism, suitably filled in, provides one of the more plausible explanations for the results of the present study. The task of this section will be to present some constraints that the nonindexical contextualist must satisfy to explain the observed results.

To see how nonindexical contextualism works, let's consider an indexical case in more detail. Consider an utterance, by me, of the sentence 'I like to dance'. The occurrence of 'I' in that utterance refers to me, so the whole utterance has the content *Dave likes to dance*.<sup>16</sup> That content is (very) true, but it might have been false; it is true with regard to the world we find ourselves in, and false with regard to other possible worlds. So, in determining the extension (truth-value) of the utterance from its content, we need to take something more into account: we must consider at least which possible world we're in. The nonindexical contextualist finds a role for context in just this way—in the step from content to extension. They can offer various theories, still, about *which* contextual factors come into play; the key to nonindexical contextualism is *when* those factors do their work.<sup>17</sup> For the details of one particular nonindexical contextualist theory of vague predicates, see (Fara, 2000); for general arguments that contextualists about vagueness should be nonindexical contextualists, see (Åkerman and Greenough, 2010).

So what would a nonindexical contextualist offer as a take on the present study? Let's start with 'The circle is near the square and it isn't near the square'. The indexical contextualist held that this sentence ascribes one property ('near the square' in context 1) and the negation of *some other* property ('near the square' in context 2) to the circle; its content was thus baldly noncontradictory. But the nonindexical contextualist doesn't go this route; she'll say that the sentence ascribes one property (nearness-to-the-square) and the negation of *that very property* to the circle. In order to avoid contradiction, then, she must say

<sup>13</sup>As measured by a one-way ANOVA,  $F(1, 148) = .24, p = .62$ .

<sup>14</sup> $\chi^2(4, N = 149) = 1.98, p = .74$ .

<sup>15</sup>This is similar to the argument in (Stanley, 2003), except that Stanley fails to distinguish between indexical and nonindexical contextualism. See (Åkerman and Greenough, 2010) for details.

<sup>16</sup>I ignore any possible context-sensitivity, of any sort, in 'likes to dance'.

<sup>17</sup>This way of framing the issue owes much to (Kaplan, 1989) and (MacFarlane, 2009).

that the one property has two different extensions with regard to two different contexts. Importantly, those contexts must both be at play in the interpretation of the single sentence.<sup>18</sup> If context is ephemeral, dependent on, say, a transient mental state of the judger (as in (Raffman, 1996)), then this should be possible. On the other hand, if context is coarser-grained, dependent on only things like world, approximate time, location, speaker, and the like, then we can see that context could not have changed mid-sentence, and so a contextualist explanation couldn't get off the ground.

By examining the elided conditions in the present study, we can see further constraints on a workable nonindexical contextualist theory. We've already seen that, for this explanation to work, the relevant features of the context in play must be relatively fine-grained. The elided conditions provide us evidence about *which* context it is that comes into play. Consider 'The circle both is and isn't near the square'. For a nonindexical contextualist explanation to work, the context relevant to determining the extension of 'near the square' cannot be the context in which 'near the square' is read by the participant. After all, there is only one such context, but the contextualist appeals crucially to a change in context between two extension-determinations.

I see two options for the nonindexical contextualist: 1) it may be that participants process this sentence into some form that contains two occurrences of 'near the square' or something (conceptual material, presumably) corresponding to 'near the square'—then each separate occurrence can be affected by the context in which it occurs—or 2) it may be that participants evaluate the conjuncts one at a time, retaining only the truth-value of each conjunct after its evaluation—then each evaluation can be affected by the context in which it occurs. Neither of these explanations is straightforwardly available to an indexical contextualist, lest she (falsely) predict that sentences like 'Mona sees you, and Louie does too' can exhibit the same kind of shift. The nonindexical contextualist, though, can avoid this prediction, by supposing that the duplication or repetition process operates on contents rather than characters or expressions.

Thus, nonindexical contextualism, suitably filled in as above, can offer an explanation of the present results. Below, I'll consider other possible explanations.

### 3.2 Noncompositional theories

Another variety of not-really-a-contradiction explanation claims that the sentences in question are not compositionally interpreted; that 'The circle is near

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<sup>18</sup>At least for indexical context-sensitivity (and why should nonindexical sensitivity differ?), it seems incontrovertible that multiple contexts can be involved in the interpretation of a single sentence. See note 12, or consider 'I am here now', which can be false if said very slowly while moving very quickly. Some authors, though, have missed this: for example Richard (1993), who writes, 'Switching contexts in the middle of interpreting a sentence is clearly contrary to the spirit, not to speak of the letter, of Kaplan's approach to indexicals.' (I'm skeptical of his reading of Kaplan.) Other authors have played it down: see (Kaplan, 1989), which makes 'I am here now' come out as a logical truth in its logic of indexicals, or (MacFarlane, 2009), which talks of context affecting whole propositions at once.

the square and it isn't near the square' directly expresses something like what's expressed by 'The circle is a borderline case of "near the square"'. Perhaps it's an idiom, or something like an idiom. Then participants' relatively high level of agreement could be explained without supposing that they agree to a contradiction.

The problem with such an account is that it's difficult to see why apparent contradictions would express borderline-case-ness. How would such an idiom get off the ground? Presumably because some other explanation canvassed here (in particular, one of the explanations in §§3.1, 3.4, or 3.5) was at one time correct; then language learners, for whatever reason, might have mistaken their elders' compositional utterances for direct claims of borderline-case-ness. This fills in the story, but it does so compositionally. Without some explanation very unlike this (lightning strike?), I don't see that a noncompositional theory can avoid essentially appealing to some compositional theory, and it seems that it will then take on the pros and cons of whatever compositional theory it chooses.

There will be a few extra cons, however. A non-compositional theory must explain why there is no significant difference in the frequency of observed hump responses between the four experimental conditions, and why there is no significant difference between the maximum responses given by participants in these conditions.<sup>19</sup> Do we have four closely-related idioms? If so, why? In addition, this strategy invokes an additional step: learners coming to acquire noncompositional uses of these once-compositionally-used expressions. Without further evidence, a noncompositional theory introduces needless complication; better to stick with a compositional story.

### 3.3 Error theories

So much for explanations that work on the hypothesis that what participants are agreeing to isn't a contradiction. Among theories that concede that participants are agreeing to a contradiction, error theories of various sorts are available. An error theorist holds that, while participants are in fact agreeing to real contradictions, they are wrong to do so—these contradictions are simply false. Those who hold a supervaluationist or epistemicist theory of vague predicates might most naturally explain the present results via an error theory.

An error theory might work something like those presented in (Eklund, 2005) and (Sorensen, 2001), according to which all competent speakers have dispositions to accept certain falsehoods involving vague predicates, or it might work in a more informal way, supposing participants to simply be mistaken, not in virtue of being competent speakers, but just in virtue of being confused, or not paying attention, or being misled by the experiment, or failing to report what they actually believe, or some such.

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<sup>19</sup>See notes 9, 13, and 14; and note that there was also no significant difference between maximum responses to conjunctive and disjunctive sentences ( $F(1, 148) = .53, p = .47$ ), nor any interaction effect on maximum responses between conjunction/disjunction and elided/non-elided (as measured by a two-way ANOVA,  $F(1, 148) = 1.37, p = .25$ ).

### 3.3.1 Competence-based error theories

I'll turn now to the former sort of error theory. Eklund's view can directly explain why participants would make errors in these cases; it's part of his theory that competent speakers have a disposition to make errors in the use of vague predicates. But the errors he takes speakers to be disposed to make are not hump-style responses. Rather, he supposes that competent speakers are disposed to believe *tolerance principles* around their vague predicates. He takes his tolerance principle from (Wright, 1975); for a vague predicate  $F$ , the tolerance principle reads:

- Whereas large enough differences in  $F$ 's parameter of application sometimes matter to the justice with which it is applied, some small enough difference never thus matters.<sup>20</sup>

But belief in a principle like this would not lead participants to give hump-style responses; rather, if it applied at all, it would lead participants to give flat responses, responses not affected by the small differences in the cases they were shown. So while Eklund predicts that participants will make a certain sort of error, he does not predict the hump-style responses given by many participants.

Sorensen (2001) faces a similar problem: although he claims that competent speakers will believe contradictions involving vague predicates, he does not predict the present results. The “contradictions” Sorensen predicts speakers to believe are sentences of the form ‘If  $a$  is  $F$ , then  $a$ 's successor is  $F$  too’, where  $a$  and its successor are consecutive members of a sorites sequence for  $F$ . Since Sorensen is an epistemicist, he thinks there is some sharp cutoff between the  $F$ s and the non- $F$ s; when  $a$  and its successor straddle this sharp cutoff, he believes this conditional to be analytically false. Nonetheless, he thinks, we believe it.

This is essentially the same as Eklund's view, except for the decision to call these tolerance conditionals “contradictions”. This sort of view, if it can be made to make any predictions at all about the present study, predicts *flat* responses, not *hump* responses. So again, this style of view cannot explain the present results.

I suppose someone might hold a view like this: being a competent speaker requires us to believe contradictions like ‘ $a$  both is and isn't  $F$ ’ when  $a$  is a borderline case of  $F$ , but nevertheless such contradictions are always false. *That* view of course would predict the hump responses obtained in the present study. But why would competent speakers believe *those* falsehoods and not others? Any view of this sort would need to answer that question. Sorensen and Eklund go to great lengths to motivate their claims that speakers believe certain falsehoods; an error theorist of this type would need some story to fill a corresponding role. I know of no error theorist who holds this kind of theory, and so I know of no error theorist who's attempted to provide such a story.

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<sup>20</sup>  $F$ 's parameter of application is the dimension along which something can vary to make it more or less  $F$ ; so ‘tall’'s parameter of application is height, ‘bald’'s is amount and arrangement of hair, &c.

### 3.3.2 Other error theories

I turn now to the other sort of error theory. This sort takes the participants who agreed with some contradiction to be mistaken for some reason other than their linguistic competence. So stated, there is a gap: on its own, this offers us no explanation for why participants would make *these* errors and not others. It could of course be supplemented with some theory about the conditions under which people are likely to make certain errors, and then that supplemental theory could be dealt with on its own merits.<sup>21</sup>

Two such supplemental theories are offered by an anonymous referee. First, it's possible that, although participants would naturally want to simply reject all the sentences, the mere fact of being asked about the same sentence again and again suggests that something else is wanted of them. This might lead participants to vary their responses. Indeed, it's likely that asking participants about the same sentence repeatedly leads at least some of them to vary their responses, to avoid being uncooperative. As the referee points out, though, this stops well short of explaining why participants would vary their responses in such a coordinated way; it would predict (correctly) few flat responses, but it would fail to predict the hump responses that predominated.<sup>22</sup>

Second, it's possible that being asked about their agreement or disagreement with the sentences, rather than the sentences' truth or falsity, suggested to the subjects that the issue at hand is a matter of personal opinion, causing them to respond to some proposition 'about which opinions could differ', rather than responding to the target sentence. I am skeptical about this hypothesis, for two reasons. The first reason is that it's not clear what this other proposition might be. In order to explain the present results, the proposition must meet two constraints: 1) it must be a plausible interpretation of the test sentences, and 2) it must be more likely to be agreed with in borderline cases. I don't know what might meet these constraints. The second reason is that agreement and disagreement are not restricted only or even primarily to matters of opinion. We quite often agree and disagree with statements of fact. As such, I doubt that asking about agreement and disagreement suggests to participants that the question is opinion-based, although there is certainly room to explore this issue further.

There may be other available hypotheses as to why participants would err in the task at hand in this experiment; each would have to be considered on its own merits.

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<sup>21</sup>NB: It can't simply be that participants err randomly under certain conditions; there are very many possible response patterns that simply didn't occur, or that occurred very rarely, while the hump pattern occurred in the majority of responses.

<sup>22</sup>A partial explanation for the relatively large number of slope responses might be lurking around here; given that participants were presented with seven smoothly-shifting pairs and asked to judge each sentence from one to seven (a coincidental double use of seven), that may have suggested to some that a smooth shift in their responses from one to seven or from seven to one was called for. This, of course, is to gesture towards an error theory of the slope responses; but I don't see how the slope responses can be accounted for without an error theory of some sort. They are in that regard quite unlike hump (and for that matter flat) responses.

### 3.4 Fuzzy theories

A fuzzy theory can both 1) allow that participants interpreted the sentences in question as contradictions, and 2) allow that participants might not be mistaken in partial assent to such sentences. This second feature is a virtue for a few reasons. First, as we've seen in §3.3, no existing error theory predicts speakers to be mistaken in this way; and second, it seems a bit odd to suppose that speakers are mistaken about what's near what, when they can see the relevant objects clearly, are deceived in no way about the distance between them, and are not under any time pressure to come to a judgment. A fuzzy theory can allow for non-mistaken (partial) assent to contradictions because on a fuzzy theory contradictions can be partially true, as we saw in §1.1.

At first blush, then, it appears that the fuzzy theorist has the resources to account for the responses observed. This appearance is strengthened if we look at the mean responses for each question (see Figure 2 on page 7): the clear cases on each end result in mean responses just above 2—very low in agreement—and the mean responses rise gradually as one approaches pair C, where the mean response is just barely above 4, the midpoint in the agreement scale. These data are very much in line with what a fuzzy theorist would most likely predict.

Appearances, though, can be deceiving. Although the mean responses to each question create a pattern congenial to the fuzzy theorist, they do so for a strikingly non-fuzzy reason. This can be brought out by considering the difference between the *maximum* of the *mean* responses (4.1) and the *mean* of the *maximum* responses (5.3). The majority of responses were hump responses, but not all humps reach their peak in response to pair C, presumably due to slight disagreements between participants on which pairs were the clearest borderline cases. Recall Figure 3 on page 7.

If the fuzzy theorist's formalism maps directly on to participants' responses, we would expect participants' responses to these contradictions to peak somewhere around 4, the midpoint. After all, none of these sentences can ever be more than .5 true, on a fuzzy theory. But this is not what happens. As reported above, more participants peak at 7—full agreement—than at any other response.<sup>23</sup> The mean of the maximum responses is 5.3—significantly above 4.<sup>24</sup>

The fuzzy theorist, faced with these data, should conclude that the fuzzy formalism does not map directly onto participants' responses, then. Here's a hypothesis she might offer: perhaps responses as high as 7—full agreement—can still indicate the speech act of .5-assertion. If this is so, then the fuzzy theorist can simply claim that participants who gave very high responses to these sentences were still only .5-asserting them.

I don't see that this hypothesis is untenable, but it would take some filling

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<sup>23</sup>Actually, more than *twice* as many peak at 7 than at any other response, and over half of participants peak at either 6 or 7.

<sup>24</sup>In fact, this is so for each of the four conditions: for conjunction, non-elided, mean 5.2,  $t(43) = 3.96, p < .001$ ; for conjunction, elided, mean 5.3,  $t(39) = 4.719, p < .001$ ; for disjunction, non-elided, mean 5.7,  $t(28) = 5.67, p < .001$ ; for disjunction, elided, mean 5.1,  $t(35) = 2.81, p < .01$ .



in. Presumably a response of 7 can also indicate 1-assertion (full assertion), so this hypothesis leads the fuzzy theorist to suppose that a 7-point scale from ‘Disagree’ to ‘Agree’ is not sensitive to the different degrees of assertion participants might wish to make. But if not this sort of scale, then what *would* be sensitive to those degrees? It seems that the fuzzy theorist appealing to this hypothesis would need to address that question. With an answer to that question in hand, a study like the present one could be conducted, to see whether participants really do indicate .5-assertion to these sentences.

Alternatively, the fuzzy theorist could offer an error theory of some sort. She might allow that although the highest level of assertion *appropriate* to these sentences is .5, most participants in fact evinced a higher level of assertion, and simply claim that these participants are mistaken. As we’ve seen, such responses are unilluminating unless conjoined with some explanation of why participants would make *these* mistakes in *these* circumstances; but there is no reason why a fuzzy theorist couldn’t propose such an explanation.

### 3.5 Dialetheisms

A dialethic theory like that presented in (Ripley, 2013) shares some of the features of a fuzzy explanation for the present data: it can allow that, in line with appearances, participants are responding to genuine contradictions; and it can allow that these participants are not mistaken. What’s more, since a dialethic theory predicts that the contradictions that occurred in this study are (fully) true, it naturally predicts levels of assent higher than the midpoint values most naturally predicted by fuzzy theorists.

This is because, according to this variety of dialethic theory, the borderline contradictions in the present study are true.<sup>25</sup> The circle really is both near the square and not near the square, when it’s a borderline case of ‘near the square’. And similarly, it’s neither near the square nor not near the square, in the same circumstances. Since participants in the present study were well-positioned to see this, and since they are competent with ‘near the square’, conjunction, disjunction, and negation, they agreed with the borderline contradictions because they recognized them as true.

A dialethic explanation, then, faces a quite different puzzle from the other theories we’ve seen. The question a dialetheist must answer is not ‘Why so much assent?’ but ‘Why so little?’. As we’ve seen, the mean of the maximum responses was 5.3. Even allowing for ceiling effects, this is unlikely to represent full agreement. But if participants were well-situated to recognize the truth, and the truth is contradictory, why would they not simply fully agree to borderline contradictions? A dialetheist owes some answer here.

Since I defend a dialethic theory of vagueness elsewhere, I’ll offer a sketch of one possible answer. It’s been alleged among cross-cultural psychologists that people from East Asian cultures are more open to contradictions than are people

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<sup>25</sup>It thus differs from the dialethic theory proposed in (Hyde, 1997), which holds borderline contradictions to always be false. A Hyde-style dialetheist would presumably resort to an error theory of some variety to explain the present results.

from Western cultures. These allegations, though, have often used a very wide sense of ‘contradiction’, much wider than that used here. For example, Peng and Nisbett (1999) count all of the following as “tolerating contradictions”:

- Preferring compromise to adversarial dispute resolution
- Preferring proverbs like ‘too humble is half proud’ to proverbs like ‘one against all is certain to fall’
- Reconciling ‘most long-lived people eat fish or chicken’ with ‘it’s more healthy to be a strict vegetarian’

Clearly, their sense of ‘contradiction’ is not the sense in play here; so while they may have found a very real cultural difference, their data do not show anything about cultural acceptance of contradictions, in our sense.

In an attempt to connect this cross-cultural research more directly to the philosopher’s idea of contradiction, Huss and Yingli (2007) ran a cross-cultural study that asked participants in Canada and China for their responses to more paradigm contradictions: the liar paradox, a *reductio* argument, and most importantly for my purposes here, a borderline contradiction. In particular, they presented their participants with a vignette describing a borderline case of ‘raining’, and asked about the sentence ‘It’s raining and it’s not raining’.

Despite the narrower focus, the results they found were broadly in line with Peng and Nisbett’s research: Huss and Yingli’s Chinese participants were much more willing to agree with the contradictions they saw than were their Canadian counterparts. This suggests that cultural differences matter for agreement with contradictions, in particular borderline contradictions. One possibility is that Westerners hold a cultural norm against agreeing with contradictions.<sup>26</sup>

Suppose this to be true. Then, despite their linguistic competence pushing them to accept the borderline contradictions, subjects in the present experiment (as well as Canadian subjects in Huss and Yingli’s study) may well have had their assent reduced by cultural norms. The effect would be much the same if we were to ask participants for their grammatical (rather than semantic) intuitions about sentences like ‘Which table did you leave the book on?’; although ending a sentence with a preposition is perfectly grammatical in English, the cultural norm against it may well drive participants to reduce their judgments of grammaticality.<sup>27</sup>

If it is true that Westerners have a cultural aversion to contradictions in general, we should expect the levels of assent given by university students in North Carolina to be somewhat lower than what would be generated purely by their linguistic competence; once we take this into account, the dialetheist has a straightforward explanation for the middling levels of assent. So it seems that the dialetheist has a plausible explanation for the observed results as well.

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<sup>26</sup>Note that if contextualism of the sort described in §3.1 is right, Huss and Yingli’s sentence was presumably not really interpreted as a contradiction either, at least by those who agreed with it. A contextualist should then probably say that Canadians are more likely to give such a sentence a contradictory reading than Chinese.

<sup>27</sup>See (Labov, 1996) for examples of this sort of response.

As an anonymous referee points out, one could also suppose that East Asians hold a cultural norm pushing in favor of contradictions; or that both Westerners and East Asians hold cultural norms pushing in favor of contradictions, but that the East Asian norm is stronger. Either of these hypotheses gibes with the cross-cultural results, but would not support the dialetheist interpretation of the present study. They might support a fuzzy interpretation or even a purely classical interpretation. Unfortunately, despite the wealth of data on cross-cultural psychology, not much is yet known about how cultural norms relate to contradictions in the sense that’s relevant here. More research is called for, to get clearer on what cultural differences exist and how they are arrived at.

## 4 Conclusions

When it comes to (apparent) borderline contradictions, then, it seems that the nonindexical contextualist and the dialetheist offer the two most plausible explanations of the observed results. Before I close, I want to draw some attention to the similarities between these views that allow them to succeed where other views do not. I also want to draw attention to just how hard it will be to design an experiment that could distinguish between these theories.

Note that the nonindexical contextualist, to plausibly explain the results of this study, needed to invoke a relatively fine-grained notion of context. In particular, it seems that context must be able to change for a participant who sees nothing different and doesn’t move. Context must thus be at least difficult to observe. Now, the nonindexical contextualist I’ve envisioned sticks to classical logic *at the level of extensions*. But since it’s very difficult to tell when we’ve changed context, this means that the logic of properties we’ll use to generate experimental predictions will blur across contexts. And when you blur classical logic in this way, the result is the paraconsistent logic LP. (See (Lewis, 1982) and (Brown, 1999) for details and discussion.)

On the other hand, the dialetheist view I defend in (Ripley, 2013) holds LP to be the correct logic of vagueness even in a single context.<sup>28</sup> Thus, it could be quite tricky to find an experimental wedge between the two views. The key to such a wedge would come from some operationalization of the notoriously slippery term ‘context’. The contextualist and the dialetheist make different predictions about what will happen in a single context. I leave this issue for future work.<sup>29</sup>

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<sup>28</sup>NB: the dialetheist is under no obligation to use a fine-grained context, although she might find reason to.

<sup>29</sup>This paper has been drastically helped by discussions with Mark Colyvan, Paul Egré, Patrick Greenough, Graham Priest, Diana Raffman, Greg Restall, Robert van Rooij, Nick Smith, audiences at the Philosophy and Psychology of Vagueness Workshop and the 2009 Amsterdam Graduate Philosophy Conference and *especially* Joshua Knobe. This research was partially supported by the Agence Nationale de la Recherche, Project “Cognitive Origins of Vagueness”, grant ANR-07-JCJC0070.

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