Parametric Context-Sensitivity*

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1 Introduction

Some expressions are context-sensitive, except when they aren't.

First example: modals. Take *must*. Compare these (Kratzer [1977]):

(1) Maori children must learn the names of their ancestors.

(2) In view of Maori tribal duty, Maori children must learn the names of their ancestors.

On the face of it, the *must* in (1) renders the sentence context-sensitive. At one context, for example one where we are talking about New Zealand law, we could use (1) to say that in view of the laws of New Zealand, Maori children have to learn their ancestors' names. We're talking about what must be according the laws. In another context, we could instead use (1) to make just the claim (2) makes, about what must be according to Maori tribal duty. Thus (1) is context-sensitive. But observe this context-sensitivity is not shared by (2), though it too contains *must*. Even if we are in a context where we are talking about the laws of New Zealand, we hear (2) as about what must be according to tribal duty. So (1) is context-sensitive in a way that (2) is not. The *must* in (1) infects the whole sentence with context-sensitivity, but apparently the infection is contained in (2), thanks to the embedding environment the expression appears in. To put it in a theory-laden and contestable way, when we utter (2) at a context c, the contribution of *must* to the determination of the proposition expressed does not depend on context. (Not anyway in the way that the *must* in (1) does.)

Second example: pronouns. Take *he*. Compare these:

(3) He is wise.

(4) Every bowler thinks he is wise.

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As everyone knows, *he* is context-sensitive: one can't figure out what the content of (3) is without assistance from the context of utterance, and pretty obviously *he* is to blame for that. Except, *he* is sometimes not context-sensitive: the *he* in (4) obviously admits of a bound reading, in which case it manifests none of the context-sensitivity it shows in (3). So *he* is context-sensitive, except when it isn't.

Third example: indicative conditionals. Suppose we're sitting in a cafe. It would be weird to say:

(5) If we're not at this cafe, we're at the one across the street.

Why? Maybe it is because indicative conditionals are sensitive to a certain feature of context, namely the information we are mutually taking for granted in the conversation. In particular, maybe there is a requirement that the antecedent of the conditional be compatible with this information (Stalnaker [1975]). We're taking it for granted that we're in this cafe, of course, so we get a clash with the antecedent. The requirement in question could be pragmatic, and/or to do with the presuppositions of the sentence; but it is natural to think it plays a role in the semantics (for example, by constraining the selection function used in the interpretation of the conditional, as on Stalnaker's theory). Thus indicative conditionals are context-sensitive—they are sensitive to states of information determined by the context (see also Gibbard [1981]). Except when they aren't:

(6) Bill believes that if we're not at this cafe, we're at the one across the street.

This sentence is not weird—on the contrary, we could sensibly use it to explain why Bill is searching the cafe across the street for us, for instance. Clearly (6) does not exhibit the same sensitivity to the context that (5) does. We are still taking it for granted that we're in the cafe we're in, but the indicative conditional no longer minds this fact now that it is embedded where it is.

The sort of context-sensitivity we see in these examples isn't the *indexicality* theorized by Kaplan [1977/1989]. Kaplan-style indexical context-sensitivity is the sort of context-sensitivity that is supposed to be impervious to embedding. The content of sentences containing the first person pronoun *I*, for instance, is generally sensitive to context, even when this expression is deeply embedded—say, in a relative clause under an attitude verb within a conditional (e.g., 'If Bill thinks that the man who I saw is Ted, he's wrong'). That's the sort of impressive fact Kaplan's theory explains with the help of an unshiftable context parameter. My interest in this paper is in the other kind of context-sensitivity, the kind of context-sensitivity that can go away under the impact of the right kind of embedding. It is the *shiftable* context-sensitivity that Ninan [2010] identifies and brings into focus, and which Recanati [2004] discusses under the heading

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'saturation'. In this paper I call it *parametric* context-sensitivity. This sort of context-sensitivity, while recognized, rarely gets singled out for direct attention, though arguably it is more pervasive than indexical context-sensitivity. I single it out here. I am less concerned to make claims about specific constructions than I am to draw out this sort of context-sensitivity and unpack its lessons.

To say what parametric context-sensitivity is, we need especially to mind the gap between semantic value and content (in the ways emphasized by Lewis [1980], Ninan [2010] and Rabern [2012b, 2013]).[1] To be a parametric contextualist about some expression is in part to endorse a certain kind of post-semantic[2] commitment about how the content of a sentence in context is supposed to be recovered from context. It is tied up with these things I will call *bridge principles*. In the next section I say how, following the trail blazed by Ninan. An expression is parametrically context-sensitive when its extension is sensitive to a parameter of the index whose value is, according to the operative bridge principle, fixed by context. The point of the next section is to say that more slowly. I come to the case of modals, our first example above, in section 3. This example will help us to see, in section 4, why parametric context-sensitivity makes for some complications in the way that context-sensitivity is best defined.

I come to the second example (pronouns, or variables generally) in section 5. In the case of third-person pronouns, parametric contextualism seems to be (at least implicitly) the standard position in the literature. Following Rabern [2013], I review some of the tensions this kind of analysis raises for the approach of Kaplan [1977/1989]. A parametrically context-sensitive analysis of third-person pronouns raises the question whether such an analysis is available for other kinds of pronoun. In section 6, drawing on Santorio [2010], I discuss a parametric treatment of first-person pronouns. The idea that first-person pronouns are in-principle shiftable raises questions about monsters, and about the status of the context parameter. Those are the topics of sections 7 and 8 respectively. Bridge principles are seen to play a central role here.

If I came to the third example (indicative conditionals) in this paper, the paper would be too long. So I save that for a sequel.

The point this paper is to come at parametric context-sensitivity from a few directions, and to see how bridge principles interact with a diversity of important debates. Many of the ideas I review are already in the literature. My interest is to impose what I hope is some useful narrative structure on it all. Almost all of my discussion takes place from the vantage point of a two-dimensional semantic framework (specifically, that of Lewis [1980]): that is the

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[1]See also Dummett [1973], Stanley [1997], King [2003], Ninan [2012b], Rabern [2012a, 2017], Yli-Vakkuri [2013], MacFarlane [2014], Stalnaker [2014], Yalcin [2014], Steinert-Threlkeld [2017], Stojnić [2017], Recanati [2018], Rabern and Ball [2019], Santorio [2019], Nowak [forthcoming].

[2]The term is from MacFarlane [2003].

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sandbox I am in for the purposes of this paper, though I step out briefly on occasion. I can imagine ways of transplanting/extending the term 'parametric context-sensitivity' to other semantic frameworks, such as a dynamic semantics, but I don't make any attempt to spell out how.

2   Truth at a context and content

So suppose we find ourselves in the sort of two-dimensional semantic framework described by Lewis [1980], drawing Kaplan [1977/1989]. I assume some familiarity with the setup. Sentences compositionally receive truth values relative to a pairs of a context c and index i, where the latter is some tuple of parameters corresponding to possible features of context. (A starter package for the index might include a world parameter and a time parameter.) The semantic values of sentences are two-dimensional intensions: functions from context-index pairs to truth values. The picture is two-dimensional in the sense that one dimension—context—is rich enough to fix a value for the other dimension—index.[3]

This two-dimensionality enables us to define an index-invariant notion of *truth at a context* in terms of our index-sensitive semantic values. We could say, following Kaplan, that a sentence is true at a context c *simpliciter* just in case you get True when you evaluate the two-dimensional intension of the sentence at the pair of c and the index i_c fixed by that context:

ϕ is true at c iff $[\![\phi]\!]^{c,i_c} = 1$

This sort of definition is 'post-semantic' in that it takes for granted that the work of compositionally assigning sentences their intensions has already been accomplished. It sits on top of the semantics.

What good is this definition of truth at a context—why should it matter whether we can define it? Here are three interconnected traditional motivations. The first two emphasize the idea that truth at a context plays an important role in bringing the compositional semantics into contact with the data it is meant to systematize. One might think the notion of truth at c, while still technical, is closer to home than the notion of truth at c, i. We seem to have judgments that certain sentences uttered at certain contexts have certain truth values. Maybe some good-enough percentage of the time, such intuitions can be explained as tracking this notion of truth at a context. If so, we can leverage those intuitions to constrain hypotheses about semantic values—the things we postulate mostly

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[3]On Lewis's setup, context and index are generally asymmetrically rich: context can fix a value for the index, but not the reverse. So strictly speaking, we don't have the same dimension twice over. We might therefore say the framework is *asymmetrically* two-dimensional, in contrast to the purer two-dimensional framework of for instance Segerberg [1973], where sentences are evaluated at pairs of worlds. There are operators definable in a pure two-dimensional semantics not definable in an asymmetric two-dimensional semantics.

in order to leverage their compositionality in an account of the productivity of linguistic understanding. Second, maybe some good-enough percentage of the time, certain intuitions can be explained as tracking consistency and entailment, where entailment is a relation that preserves truth at a context. So again, the definition connects the two-dimensional intensions postulated in the semantics to the facts they are supposed to help illuminate.

Here is the third motivation. One might think that a sentence is true at a context exactly when its *content* is true at that context, and that the significance of the former owes largely to the fact that it tracks the latter. That is an intuitive idea. Here I am following Lewis [1980], not to mention Dummett [1973], Kaplan [1977/1989], Stalnaker [1978] and many others, in supposing that we have a need to associate declarative sentences with items of content—assertoric contents, propositional contents, propositions—which are distinct from their semantic values (their two-dimensional intensions), but which can be recovered from these values plus context. As Kaplan might put it, sentences in context *say things*, and what gets said by a sentence in context is, at least usually and in one important sense, the content of the sentence. But I won't lean on the idea that tracking a notion of "what is said" is at the core of the content role. The authors I recently cited have diverse, not-always-totally-obvious conceptions of the content role—of what the job description of content is exactly—but typical versions of this job description include familiar things like: being fit to be the object of attitudes like belief; being *what is represented* by certain representations; being the fundamental bearers of truth values; being the fundamental relata of the consequence relation; being the sort of thing, the having of which by mental states has something important to do with the functional role of the state, and with the potential of an ascription of the state to explain action; being the sort of thing that one, in uttering a declarative sentence, is trying to put into conversational play—is trying to add to the common ground of the conversation—and which corresponds to the information the sentence in context conveys. And so on. While I am opinionated about how to think about the content role (Yalcin [2014]; also Yalcin [2018a,b]), there isn't a need to get into here. The main point for now is that the sort of thing that best realizes the content role could well be—and on most theories, is—different from the sort of thing that realizes the semantic value role.

We are already supposing, for the sake of this paper, that the latter role is played by certain two-dimensional intensions. Most philosophers with opinions on the matter won't take such intensions to be the realizers of the content role. For a simple example, take the view favored by Stalnaker, according to which the realizers of the content role are sets of possible worlds. Two-dimensional intensions and sets of worlds are different sorts of things, so the meaning (semantic value) of a sentence and its content couldn't be the same on

such a view.

But maybe the meaning of a sentence *in context* and the content of a sentence *in context* are the same? That is how Kaplan [1977/1989] sought to understand things: he describes his two-dimensional intensions as mappings from contexts into contents. But I accept Lewis [1980]'s arguments against this conflation, together with the further considerations presented by Ninan [2010], Rabern [2012a, 2013]. What exactly is left after you evaluate a two-dimensional intension at context is a function from indices to truth-values. Thus it is depends on what sort of parameters your index contains. What parameters the index contains frequently depends on such things as whether the architecture of the language treats some meaning relationships between expressions as operator-operand relationships. This may well be a parochial matter about how that language happens to work. Such factors should influence our opinion about the richness of our indices in a compositional semantics for the language, but they needn't impact our view about what plays the content role.

For instance: if, owing to some deep reflections on representational mental states, you emerged with the view that sets of possible worlds do best as the realizers of the content role, your confidence needn't be shaken by the possibility of linguistic data which suggests that the natural language you speak deserves indices that contain a parameter for time (because it contains expressions helpfully modeled as temporal operators). As Lewis emphasized, if you want the notion of the content of a sentence in context, it is enough that you can recover this content object from the two-dimensional intension of the sentence, together with relevant aspects of context. One doesn't need the idea that the content of a sentence in context is literally identical to the result of evaluating its two-dimensional intension at context. That is *one* especially simple kind of principle bridging semantic value and content—I'll call it the *Kaplan* bridge principle—but one shouldn't sign up for it from the thought it is somehow conceptually necessary. If you do that, it is apt to artificially limit your movement in compositional semantics. One can have a bridge principle that is a bit more subtle than Kaplan's.[4]

For instance, suppose you are with Stalnaker: contents are sets of possible worlds. But suppose also you are doing semantics for an operator-rich language. Your language has parameters for worlds w, times t, and, say, three other things x, y, z, who cares what they are. Then it's easy to see how, abstractly, to write a bridge principle which tells you how to recover the content of a sentence in context as a function of its very rich two-dimensional intension:

Bridge principle 1.

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[4]Indeed, as we'll eventually see (section 5), there are good reasons to prefer a bridge principle more complicated than Kaplan's. (In fact, there are good reasons for *Kaplan* to prefer a bridge principle more complicated than Kaplan's.)

The content of ϕ in c is $\{w : [\![\phi]\!]^{c,w,t_c,x_c,y_c,z_c} = 1\}$

We see that context fixes values for the parameters which the content of the sentence is not variable with respect to. To use Recanati's term, it provides the instructions for saturation (Recanati [2004]).

Now it's not hard to see that given such a view, a sentence is true at a context exactly when its content is true at that context.[5] So, circling back to the point that started us down this road, one might think truth at a context matters because it aligns with the truth of the sentence's content in context. For one might think that, at the end of the day, assertoric content is the main thing. One might think that the main payoff for knowing ('cognizing') a compositional semantics for a language is that it enables one to transfer (and receive) information; the information transferred is content; and that intuitions about the truth of a sentence tend to track, most of the time, its content.

It is good to see that the definition of truth at a context is not by itself a content bridge principle. Two theorists might disagree about the right content bridge principle, but agree about the definition of truth at a context for sentences. Compare for instance the last indented bridge principle to this temporalist alternative:

Bridge principle 2.

The content of ϕ in c is $\{\langle w, t\rangle : [\![\phi]\!]^{c,w,t,x_c,y_c,z_c} = 1\}$

This principle implies that contents are variable in truth with respect to time in addition to world. They are temporalist propositions. The eternalism of our first bridge principle is rejected. Yet one might accept this principle while also accepting the definition of truth for sentences given above: for one could hold that a sentence is true at a context c just when the temporalist proposition it expresses is true as evaluated at the pair consisting of the world of the context and the time of the context. (I say this is *one* possible temporalist position.) The disagreement between this theorist and our eternalist would not be visible from the point of view of the question: which *sentences* are true relative to which contexts?

This is important to keep in mind when we talk about context 'initializing' an index parameter. An ambiguity lurks there. The eternalist and the temporalist agree that context will fix a value for the time parameter when we come to say when a sentence in context is true. So in one clear sense, the temporalist agrees that context 'initializes' this parameter. However, in another equally clear sense, she doesn't: she rejects the idea that context initializes the time parameter when it comes to saying what the content of the sentence is.

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[5]I'm assuming the usual idea that a possible worlds proposition is true *simpliciter* when it contains the actual world.

This difference matters to the way that the eternalist and the temporalist answer the question: are tensed sentences context-sensitive? On one legitimate precisification of 'context-sensitive', our eternalist says *yes* and our temporalist says *no*. For our eternalist holds that the content of a tensed sentence is partly determined as a function of the time fixed by context of utterance, whereas the content that the temporalist associates with the sentence is not sensitive to context in this way. This dispute is not visible at the level of compositional semantics, and neither is it visible at the post-semantic stage of defining truth at a context. It's about the bridge principle.[6]

One way to come at this to say that a bridge principle—or anyway, the subclass of bridge principles I want to focus on in this paper—divides index parameters into (at least) two groups. I will say that a bridge principle declares some index parameters *content fixing*, and declares others *content variable*.[7] So our eternalist says that the time parameter is content fixing, whereas our temporalist says it's content variable. If we wanted, we could mark out which parameters are treated as content-initialized by whatever bridge principles are in question. For instance, we could decorate those parameters with stars. So when our eternalist is doing compositional semantics but wants to make it clear that certain parameters but not others are viewed by her as content determinative— that a bridge principle to that effect is operative in the background—she can write: $[\![\alpha]\!]^{c,w,t^\star,x^\star,y^\star,z^\star}$.

All this means there is room for distinctive, index-parameter-induced form of context-sensitivity. An expression α might introduce context-sensitivity into a sentence, not because its semantic value is directly a function of context— as with straightforward indexicals analyzed in the classic Kaplan style, whose semantics values are always some nontrivial function of the context parameter c:

$$[\![\alpha]\!]^{c,i} = ...c...$$

—but instead because the expression is some nontrivial function of a content fixing parameter p of the index i:

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[6]Thus I agree with Ninan when he proposes "that the definition of assertoric content also be regarded as part of the postsemantics, and that its theoretical significance is comparable to that of the definition of truth at a context" [Ninan, 2010, 363].

[7]My notion of 'content fixing' roughly aligns with Kaplan's talk of context "generating" content (Kaplan [1989, 591]; see also Rabern [2013], Rabern and Ball [2019]). But Kaplan thinks of context as generating content for subsentential components—he has a picture of content as structured—whereas I do not apply the notion of content below the sentential level, partly for reasons Rabern [2013] brings out. So I vary the terminology.

Also: since Kaplan identified the parameters of the index with the parameters along which content could vary, his term 'circumstance of evaluation' is subject to ambiguity: one could use it as a synonym for 'index' (cf. [Ninan, 2010, 356]), or one could use it intending to pick out the full suite of what I am calling the content variable parameters (cf. [MacFarlane, 2009, 245, fn. 17]). So I'll just avoid this term.

$$\llbracket \alpha \rrbracket^{c,i} = ...p_i^{\star}...$$

Parametric context-sensitivity corresponds to Ninan's notion of *shiftable contextualism*:

> In general, shiftable contextualism about an expression e will arise whenever two conditions obtain: (i) e is sensitive to parameter X of the index, but (ii) parameter X is fixed to its corresponding context value in the definition of assertoric content. [Ninan, 2010, 371]

What Ninan means by 'the definition of assertoric content' is what I mean by 'bridge principle'. (I avoid calling these principles 'definitions' so as not to generate the impression that such principles capture the job description associated with the notion of content. They generally give no indication of the content role.) Note that as defined by Ninan, shiftable contextualism about e is actually compatible with the possibility that the relevant parameter e is *not* shiftable by any operator in the language. What matters is just whether e is sensitive to a content fixing parameter. This is one reason I use 'parametric' rather than 'shiftable' in talking about this kind of context-sensitivity.[8] But 'parametric context-sensitivity' and 'shiftable context-sensitivity' are interchangable, so long as one means by 'shiftable' what Ninan does.

I just mentioned the possibility of index parameters which are such that no operators in the language happen to shift them—parameters that are *de facto* unshiftable. That will sound puzzling if one thinks the only motivation one could have for a postulating a parameter is evidence that the language contains operators for shifting it. But there are other ways to motivate a parameter, as MacFarlane [2009, 245] notes. For instance, parameters are good for separating meanings that need separating. We should like to semantically distinguish coextensive predicates like *renate* and *cordate*. If we have a possible worlds parameter, the predicates can receive distinct intensions. That's a semantics-internal motivation for the parameter, separate from the question whether there are any modal operators in the language. Or again: does France fall into the extension of *hexagonal*? A possible view is that it does (relative to some standards of precision) and it doesn't (relative to others). One might capture that idea by giving *hexagonal* an extension relative to a world parameter and a standard of precision parameter, so that France might fall in or out of the extension of

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[8]Another is that 'shiftable context-sensitivity' could bring to mind the (different) idea, discussed below, that the context parameter is shiftable ('shiftable-context sensitivity'); and another is that it could bring to mind the (different) idea of one sort of context-sensitivity getting shifted to another sort of context-sensitivity.

Since the target context-sensitivity is a kind of sensitivity to indices, the ideal term would probably have been *indexical* context-sensitivity. But post-Kaplan, that label tends to get used to describe sensitivity to the context parameter. I follow that usage of 'indexical' in this paper.

hexagonal with variation in the standard of precision parameter only [Lewis, 1980, 21]. That motivates a parameter for standards of precision, even if there are no operators for shifting the parameter.

Summarizing: in addition to indexical context-sensitivity, there is parametric context-sensitivity. With parametric context-sensitivity, it is in a sense the value of the parameter that is context-sensitive. Expressions are context-sensitive mediately, via their sensitivity to a content fixing parameter. Here are the definitions to match our discussion:

> Expression α is *indexical* just in case for some c, c', i, $[\![\alpha]\!]^{c,i} \neq [\![\alpha]\!]^{c',i}$
>
> Expression α *makes for parametric context-sensitivity* just in case for some c and some pair i, i' differing at most in the value of a content fixing parameter, $[\![\alpha]\!]^{c,i} \neq [\![\alpha]\!]^{c,i'}$.

One possible reason parametric context-sensitivity has not received much explicit attention is the fact that given the sort of bridge principle implicitly assumed by Kaplan [1977/1989], it is ruled out. Kaplan takes the meaning of a sentence to be a *character*, which he describes as a function from contexts to contents. Thus Kaplan goes in for the following bridge principle, which says that the content of ϕ in c is whatever is left over when you evaluate the two-dimensional intension of a sentence at c:

> **Kaplan bridge principle.**
>
> The content of ϕ in c is $\{i : [\![\phi]\!]^{c,i} = 1\}$.

This bridge principle implies that there are no content fixing index parameters. So it is incompatible with the existence of parametric context-sensitivity. Conversely, the presence of parametric context-sensitivity implies the falsity of the Kaplan bridge principle. Thus any evidence in favor of parametric context-sensitivity is evidence against the Kaplan bridge principle.

3   Case 1: Modals

Let's circle back to our first case. Kratzer [1977] famously suggested that a sentence like:

(1) Maori children must learn the names of their ancestors.

can, when uttered in an appropriate context, say just what (2) says:

(2) In view of Maori tribal duty, Maori children must learn the names of their ancestors.

On one (perhaps exegetically inaccurate but anyway worth examining) way of reading Kratzer, part of the idea is that the sentence (1) is context-sensitive in a way that (2) is not. The relevant context-sensitive expression in (1) is the modal *must*. This expression appears also in (2). Yet we have the feeling that context is doing more work contributing to the content of (1) than it is for (2). In (2), that work is carried out the *in view of*-phrase. So as whole, this sentence exhibits less context-sensitivity than its pithier counterpart. Examples in this vein could be devised for basically any modal in English.

This is hard to understand if *must* is indexically context-sensitive, since that views leads us to expect (1) and (2) to be equally context-sensitive. But it is not hard to understand if *must* is parametrically context-sensitive. Parametric context-sensitivity is context-sensitivity that can be semantically turned off. Suppose our semantics incorporates a content-fixing modal accessibility relation parameter R; and for concreteness suppose we have a content-variable world parameter, and nothing else in the index. Let the modal be sensitive to the accessibility relation parameter, for instance with a semantics like this:

$\llbracket \text{must } \phi \rrbracket^{c,w,R} = 1$ iff for all w' such that wRw', $\llbracket \phi \rrbracket^{c,w',R} = 1$

The bridge principle in the background is:

The content of ϕ in c is $\{w : \llbracket \phi \rrbracket^{c,w,R_c} = 1\}$

This predicts that a contextually supplied accessibility relation is what will be used in determining the content of the sentence (1). Its content is:

$\{w :$ for all y such that $wR_c y$, Maori children learn the names of their ancestors in $y\}$

In the sort of context c under discussion for (1), the idea is that R_c would be[9]

$R_c = \{\langle w, y \rangle : y$ is compatible with Maori tribal duty in $w\}$

Thereby we predict that the content of (1) depends on the context.

But we can also predict the context-*in*sensitivity of (2). For we could allow operators, notably *in view of*-phrases, to shift the accessibility relation parameter, overwriting its value for sentences the operator embeds. For instance, we could say:

$\llbracket \text{in view of Maori tribal duty } \phi \rrbracket^{c,w,R} = \llbracket \phi \rrbracket^{c,w,R'},$

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[9]Of course, a story is owed about how R_c is defined *in general*, for arbitrary contexts. Kratzer already carries a burden corresponding to this, about how conversational backgrounds are supposed to be fixed. Presumably it has something to do with speaker intentions and with question under discussion in discourse. I won't try to carry the burden here.

where

$$R' = \{w, y : y \text{ is compatible with Maori tribal duty in } w\}$$

This has the result that the content of the (2) does not vary with context in the way (1)'s content varies: its content at a given c is not determined with the help of R_c. For (2), it does not matter how context initializes the value of the R parameter. By the time the value of this parameter matters—by the time the embedded modal is interpreted—the parameter has been shifted by the operator embedding it, and in a way that is insensitive to the initial value of this parameter.

This example is of course simplistic in the details. Most theorists, Kratzer included, will prefer a more complicated clause for the modal, one involving also some ordering of worlds; and many will want to follow Kratzer in using conversational backgrounds (functions from worlds to sets of propositions) instead of simple accessibility relations to articulate the restriction on the modal. Further, no doubt *in view of*-phrases are semantically more complicated. If these phrases can in fact shift the restriction of a modal, the shifting seems to be optional, not obligatory (see Yalcin [2016] for some examples). But these places where the story can be elaborated are orthogonal to the main point, which is that if one wants to reconcile the idea that (1) is context-sensitive *because* it contains *must* with the idea that (2) is *not* context-sensitive *despite* also containing *must*, the thesis that *must* makes for parametric context-sensitivity can square this circle. The account could be scaled to more elaborate settings. We could equally well have one or more parameters for modal bases, and one or more parameters for ordering sources, and tell a parametrically contextualist story in the same vein.

4   Defining context-sensitivity

What does it mean to say that (1) is context-sensitive but (2) isn't? Here are some further definitions. Where ϕ is an unembedded sentence,

ϕ is *context-sensitive* just in case for some c, c', the content of ϕ relative to c differs from the content of ϕ relative to c'.

ϕ is *indexically* context-sensitive just in case it is context-sensitive, and that is at least partly because it contains an indexical.

ϕ is *parametrically* context-sensitive just in case it is context-sensitive, and that is at least partly because it contains an expression which makes for parametric context-sensitivity.

Note that the context-sensitivity of an unembedded sentence is a bridge principle-dependent notion, since it is defined in terms of content. Change the bridge

principle, and you potentially change which unembedded sentences count as context-sensitive.

Observe also the restriction to *unembedded* sentences. Why not leave it out, as is typical? For instance:

> A sentence is context-sensitive if and only if it expresses different propositions relative to different contexts of use. Stanley [2005a, 16]

The problem arises when we consider a pair like (1) and (2) relative to the very same context c. Suppose we consider a c such that R_c is the accessibility relation fixed by the laws of New Zealand, rather than by Maori tribal duty. What proposition does 'Maori children must learn the names of their ancestors' express relative to c? Is a proposition whose truth turns on the laws of New Zealand? That's of course plausible for the sentence considered unembedded, but we don't want to say that about the sentence when it is embedded as it is in (2), even when (2) is considered relative to exactly the same c.[10]

Really it's not clear what it means, given the discussion so far, to say that an embedded sentence "has content" or "expresses a proposition". The bridge principles which tell us how to recover the content of (proposition expressed by) a sentence plus context are *post*-semantic—specifically, post-compositional. They handle unembedded sentences. For all we have said, the notion of content does not apply to embedded constituents. Those constituents of course have meanings—compositional semantic values—but not necessarily content in the sense we have been using that notion. Items of content are things that compositional semantic values conspire to help determine. It's common to speak casually of the 'semantic content' of subsentential expressions, but since that talk risks blurring the semantic with the post-semantic, I avoid it.

This is also brings out the limitations of a definition along these lines:

> To say that e is context sensitive is to say that its contribution to the propositions expressed by utterances of sentences containing e varies from context to context. Cappelen and Lepore [2005, 146]

We have not defined what an expression's "contribution to the proposition expressed" is—it could not be compositional semantic value, since that never varies from context to context for any expression—but whatever it is, *must* plausibly shakes out as context-sensitive on this definition, simply because (1), considered unembedded, expresses different propositions relative to different contexts, and the *must* it contains is squarely to blame. But the proposition expressed by (unembedded) (2) does not vary at all from context to context, though it too contains *must*. Whether *must* introduces context-sensitivity really depends

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[10]From an abstract perspective, the worry here is related to the worry Rabern [2013] presses against Kaplan in connection with variable assignments (reviewed in section 5 below).

on the embedding environment. To declare *must* context-sensitive (full stop) misses the nuance. More accurate would be to say that *must*, along with the whole sentence (1), make for parametric context-sensitivity, that (1) considered unembedded is (parametrically) context-sensitive, and that (2) is not context-sensitive.

While we're straightening out definitions, it's good to separate parametric context-sensitivity from another idea. Since parametric context-sensitivity is not indexical context-sensitivity, it might sound like what John MacFarlane calls *nonindexical contextualism* (MacFarlane [2009]; see also MacFarlane [2014, 4.6]). But these things are not the same, for MacFarlane has some different things in mind by 'indexical' and 'context-sensitivity'. His definitions go like this. Where P is a feature of context,

> An expression is *P-context-sensitive* iff its extension at a context depends on the P feature of the context.

> An expression is *P-indexical* iff its content at a context depends on the P of that context.

MacFarlane's definition of 'context-sensitivity' is very broad (as he stresses). On this definition, most of us shake out as contextualists about predicates like *book* and *proton* and quantifiers like *some* and *every*, because the extensions of these at a context depend on a feature of context, namely, the world of the context. MacFarlane would say that the interesting questions are not about whether an expression is context-sensitive, but whether it is P-context-sensitive for some aspect P of context, and about whether P-context sensitivity needs to be explained in terms of P-indexicality. Context-sensitivity without indexicality (using those terms as MacFarlane defines them) is what makes for nonindexical contextualism.

MacFarlane's way of defining 'indexicality' is close to the way other authors, such as those cited recently, would define 'context-sensitivity'. So it is not surprising that this definition of indexicality leads to the sort of difficulties we have just been reviewing. Holding fixed the analysis of section 3, take again (1). Is this sentence sensitive to the accessibility relation feature R of context? Certainly the content of the sentence at c depends on R_c. So it looks to be R-indexical on MacFarlane's definition. But of course, when the sentence is embedded as in (2), all bets are off. The whole sentence (2) is not R-indexical on MacFarlane's definition. Should we say nevertheless that its subclause is R-indexical? But supposing temporarily that we can speak with propriety of the content of embedded clauses, it would seem wrong to say that the content of the subclause depends in any way on context. Certainly it is not a function of R_c. Thus when an expression or sentence make for parametric context-sensitivity, it's hard to say whether they count as indexical or not, given MacFarlane's

definition.

It seems unclear how to apply MacFarlane's notion of indexicality in a setting where expressions can be parametrically context-sensitive. The same goes for ideas which are defined in terms of that notion—in particular, nonindexical contexualism. In any case, it is clear enough that nonindexical contextualism is a different thing than parametric context-sensitivity.

5   Case 2: Variables

Earlier I said a content bridge principle divides index parameters into at least two groups: content fixing and content variable. There is a third way a content bridge principle might deal with a parameter: it might bind it.

One sees a version of this sort of idea in the textbook semantics for first-order logic. This semantics is usually given as a recursive definition of *satisfaction*: the semantics compositionally defines what it is for a wff to be satisfied by a pair of a model and a variable assigment. Although satisfaction is relative to a model *and assignment*, truth isn't: truth is only relative to a model. Yet truth at a model is defined in terms of satisfaction at a model and variable assignment. Typically it looks something like this:

$M \vDash \phi$ iff for any g, $M \vDash_g \phi$

That is, ϕ is true relative to model M ($M \vDash \phi$) just in case for any variable assignment g, ϕ is satisfied by M relative to g ($M \vDash_g \phi$). The unrelativized notion is defined in terms of the relativized notion by quantifying into the latter's open position, tying that position off.

Turning back to our two-dimensional setting, it is not uncommon to think of variable assignments and index parameters as somehow set apart from each other once they are both on the scene. Maybe this is partly because index parameters usually correspond to elements that can be found within the underlying semantic model, whereas a variable assignment could be conceived of as a mapping from an exogenous element (variables). Another reason assignments and indices are kept apart may be because there is debate, for some linguistic phenomena, about whether they are best handled on the model of modal operators, or on the model of quantifiers and variables. (See for instance the discussion of tense in King [2003]; also Cresswell [1990].) Be that as it may, there is no harm in thinking of variable assignments as corresponding to just another index parameter (Lewis [1970]), and that is how I will think of them here. In first-order logic, after all, quantifiers are sentential operators which semantically function as assignment-shifters.

There is an interesting tension in Kaplan [1977/1989] about how to deal with the variable assignment. When he defines truth at a context for his formal

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semantics (547), the definition goes like this (using our notation, and skipping reference to models):

ϕ is true at c iff for all g, $[\![\phi]\!]^{c,w_c,t_c,g} = 1$

While context is used to fix the world and time parameters, the variable assignment parameter is separated out—he universally quantifies over it to tie off, in the style we just saw is usual in the semantics for the language of first-order logic. However, in Kaplan [1989], a different idea is floated:

> Taking context in this more abstract, formal way, as providing the parameters needed to generate content, it is natural to treat the assignment of values to free occurrences of variables as simply one more aspect of context. My point is taxonomic. The element of content associated with a free occurrence of a variable is generated by an assignment. Thus, for variables, the assignment supplies the parameters that determines content just as the context supplies the time and place parameters that determine content for the indexicals "now" and "here". (591).

That's to say, we can speak with propriety of the "the variable assignment of the context", as we can about the world or time of the context. These remarks point towards a definition of truth at a context that would bring the assignment function in line with the other parameters:

ϕ is true at c iff $[\![\phi]\!]^{c,w_c,t_c,g_c} = 1$

Now we have already noted that the definition of truth at a context is one thing and the bridge principle connecting semantic value to content is another. We said that Kaplan goes in for the Kaplan bridge principle, which says that the content of ϕ in c is just whatever is left over when you evaluate the two-dimensional intension of a sentence at c. That's a function from indices to truth-values. This means that if the indices include a variable assignment parameter, then this object must vary in truth with respect to variable assignment.

That is a rather nonstandard idea about the occupant of the content role for sentences—and one Kaplan nowhere explicitly embraces. On the contrary, it is pretty clear he thinks that while propositions vary in truth with respect to world and time, they do *not* vary in truth with respect to variable assignment.

There is a problem here, as Rabern [2013] brings out (see also Rabern and Ball [2019]). We can't: (i) have the Kaplan bridge principle, (ii) insist that the realizer of the content role is *not* something that varies in truth with respect to variable assignment, but (iii) use variable assignments to give compositional semantics for quantifiers and variables in something like the usual way. For (i)

and (ii) together entail that there is no variable assignment parameter in the index; but (iii) entails that such a parameter has to be *some* shiftable aspect of the point of evaluation for sentences. At best we seem cornered into the weird idea that, since we can't conceptualize variable assignments as a component of the index, we must locate the shiftable variable assignment dimension of meaning somehow in the context parameter. That is, we seem to have to say that quantifiers shift assignments by shifting the context parameter. (Or we must now trade our single context parameter for a set of separately shiftable "context parameters", one of which is a variable assignment parameter.[11]) That would seem to make quantifiers, in Kaplan's jargon, monsters.

Obviously this is not where Kaplan wanted to end up. Whether or not we should be afraid of monsters, ordinary variable binding would seem to be a surprising reason to let them in. Maybe the realizer of the content role is the sort of thing that varies with something like variable assignments (cf. Heim [1982], Cumming [2008], Ninan [2012a], Stalnaker [2014]), but the mere fact that we need variable assignments in the semantics for quantifiers is not an especially good reason for thinking so.

I think it is clear how we should want to escape this problem: give up (i), but keep (ii) and (iii), together with the idea that context fixes a default assignment. The variable assignment parameter is part of the index, but it is content-fixing. For instance, our bridge principle might be:

Bridge principle 3.

The content of ϕ in c is $\{w : [\![\phi]\!]^{c,w,t_c,g_c} = 1\}$

Or, if want we to be temporalist,

Bridge principle 4.

The content of ϕ in c is $\{\langle w, t \rangle : [\![\phi]\!]^{c,w,t,g_c} = 1\}$

A principle along such lines fits much of what Kaplan wants to say. (Though it does not save Kaplan's idea that *content* is compositional. More on that below.)

I think this is in many respects the sort of solution we find implicitly in the literature. For it allows us to the kind of thing that is has routinely been said about the semantics of pronouns for decades (see for instance, Quine [1960], Montague [1970], Dowty et al. [1980], Heim and Kratzer [1998]). On the one hand,

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[11]Despite the fact that contexts correspond to a single parameter in the formalism of Kaplan [1977/1989], Rabern [2013] reads Kaplan as working with just such a 'parametrized' notion of contexts in the semantics, citing remarks at Kaplan [1989, 591]. As indicated, I confine myself to Lewis's style of two-dimensional semantics in this paper, where contexts are not definitely not parametrized. (More on the context parameter in section 8.)

(3) He is wise.

can be understood to be about a particular contextually fixed person—say, Jeff Lebowski. We model that by saying that the pronoun is a variable, that the context of utterance fixes[12] a variable assignment, and that assignment assigns the pronoun (variable) a suitable denotation—for instance, Jeff Lebowski (or an individual concept of Jeff Lebowski, etc.). When we then turn to:

(4) Every bowler thinks he is wise.

we see the pronoun in the embedded clause has a bound reading. We don't need an ambiguity theory of the pronoun to handle the bound and free occurrences, any more than such a theory is required in the semantics of first-order logic. The quantifier, or its associated lambda abstract, shifts the variable assignment for the embedded clause. To arrive at the truth-conditions of the whole, we must consider the embedded clause at a range of shifted assignments, in basically the way we see in first-order logic.[13] But the result of the semantics is that (4) is *not* variable assignment-sensitive—its truth value and content do not depend on the contextually fixed assignment function—whereas (3) is so dependent. This is a paradigm of parametric context-sensitivity.

Since this way of thinking about pronouns is familiar, parametric context-sensitivity is familiar. And since many, many things in natural language semantics have been analyzed with the help of (perhaps covert) variables of various sorts—think of quantifier and modal domain restrictions, tenses, comparison classes for gradable adjectives, situation or event variables in the treatment of aspect, relational expressions like *local* and *home*, and so on, in a list that could be arbitrarily extended—parametric context-sensitivity starts to look like context-sensitivity in its garden-variety form. The kind of indexical context-sensitivity that Kaplan [1977/1989] is focused on—expressions whose context-sensitivity seems especially resistant to being shifted away by any embedding environment, like the first-person pronouns and demonstrative expressions— begins by contrast to look rather exceptional.

6   First-person pronouns as parametrically context-sensitive

Indeed, those expressions start to look so exceptional that one begins to suspect they can't really be exceptions. Pressure to bring their analysis closer to the paradigm represented by third-person pronouns comes *inter alia* from bound

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[12]Somehow—insert here a theory of how the fixing works. Also we might prefer to say that context fixes only a partial variable assignment, which could be represented as a set of total variable assignments.

[13]Recall the first-order logic clause is: $M \vDash_g \forall x \phi$ iff for all $d \in D_M, M \vDash_{g[x \to d]} \phi$, where $g[x \to d]$ is a variable assignment mapping x to d and which is everywhere else like g.

readings. Let me briefly discuss the case of first-person singular pronouns. My interest is not in mounting any full defense the view that these pronouns are parametrically context-sensitive. My interests are conceptual. I only want to sketch (drawing on Santorio [2010]) what such a view would look like, and thereby to give a sense of the sort of the potential empirical reach of parametric context-sensitivity.

On the issue of whether and how I is shiftable, two sorts of data have received particular attention.[14] One is evidence of indexical-shifting intensional operators in languages beyond English, like Amharic, Zazaki, and Slave (Schlenker [2003], Anand and Nevins [2004], Anand [2006]). Second there are the kind of cases discussed by Rullman [2004]—what Kratzer [2009] calls "fake indexicals". This example from Partee [1989] was perhaps the first:

(7) I'm the only one around here who will admit that I could be wrong.

The embedded occurrence of the first-person pronoun seems to have a reading where it performs as a variable bound by a predicate abstract. ("I'm the only one around here with the property of being an x who will admit that x could be wrong.") This example is obviously difficult to explain if the semantics for I is given in Kaplan's style—for instance, some version of:

$[\![\mathbf{I}]\!]^{c,i}$ = the speaker of c

For in the absence of context-shifting operators, this semantic value lead us to expect an unshiftable referent.[15]

Kratzer [2009] argues that bound variable readings for first-person pronouns "present a major challenge for unified semantic analyses of referential and bound variable pronouns", because although "a unified account for indexical and bound variable uses is easy to achieve for the third person pronoun he" there "seems to be no straightforward way to assign [first person pronouns] interpretations that could produce both indexical and bound variable readings" (188). To make her point, she considers a hypothetical treatment of I as a variable parallel to he:

For all variable assignments g admissible in context c:

(a) $[\![\mathbf{he}_5]\!]^{c,g} = g(5)$ if $g(5)$ is a single male, undefined otherwise.

(b) $[\![\mathbf{I}_5]\!]^{c,g} = g(5)$ if $g(5)$ is the speaker in c, undefined otherwise.

She writes:

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[14] A third sort of motivation is pursued in Santorio [2010, 2012]. See Stalnaker [2014], Rabern and Ball [2019] for further discussion of Santorio's examples.

[15] Some authors (e.g., Schlenker [2011]) view these two sorts of case as disconnected; others (e.g., Kratzer [2009]) think they are related.

Assuming that admissible variable assignments are constrained by utterance contexts, (a) covers both indexical and bound variable uses of *he*. A particular context c might determine that 5 picks out your grandfather, for example. All variable assignments admissible in that context will then assign your grandfather to 5. Since the reference of *he* is fixed in such a context, *he* comes out as a referential pronoun. Other contexts might not determine a reference for 5. In that case, different assignments admissible in such contexts could assign different individuals to 5, and he_5 could thus be treated as a nontrivial bound variable pronoun. This type of account cannot be extended to 1st or 2nd person pronouns. Any admissible context c must pick out fixed referents for those pronouns. Even if we represent 1st or 2nd person pronouns as bound variables, as in (b) all admissible assignments for a given context c have to assign the same individual to them and, consequently, (b) cannot produce a nontrivial bound variable reading for I_5. (188)

Drawing especially on Cable [2005], Schlenker [2003], Anand and Nevins [2004], Anand [2006], Kratzer ultimately favors the thesis that there is a species of predicate abstraction that involves context-shifting. She explores what it takes to explain the apparently highly limited distribution of this form of abstraction.

There clearly is a problem of explaining how Partee's examples work without overgenerating—without predicting binding possibilities for first-person pronouns that don't exist—and Kratzer advances our understanding on this matter. But I want to examine the way Kratzer sets up the problem in the paragraph quoted above, in particular with the contrast she draws to the third-person case. She seems to say that the difference between a bound and a free (or "referential") occurrence of he_5 depends on the extent to which context resolves the value of this pronoun. In particular, in order to get a bound reading for he_5 at a context c, she seems to suggest that c should not "determine a reference" for he_5.

Is this the case? Let's consider an example sentence, with two occurrences of the same pronoun (having the same variable index):

(8) He$_5$ is wise, and every bowler thinks he$_5$ is wise.

Depicting the sentence with the above indexing is usually understood to convey that the pronouns are co-referential. So normally this would be read as picking out a reading of the second pronoun where it is unbound by the intervening quantifier. But one key thing missing here is any indication of what the binder associated with the quantifier is binding. Make the routine assumption that a quantifier phrase can be associated with an index corresponding to the variable it binds.[16] Then here are two possibilities:

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[16]The association might come via affiliation with a lambda abstract which does the real

(9) He$_5$ is wise, and [every bowler]$_5$ thinks he$_5$ is wise.

(10) He$_5$ is wise, and [every bowler]$_4$ thinks he$_5$ is wise.

(9) corresponds to a bound reading of the second occurrence of he_5, while (10) corresponds to a free (referential) reading. Of course, the situation is exactly like the difference in predicate logic between $(Fx \wedge \forall x Gx)$ and $(Fx \wedge \forall y Gx)$. So there is no trouble with the possibility that (i) context c fixes a value for he_5, though (ii) there are occurrences of he_5 which are bound as considered relative to that very c. A variable in ϕ taking a bound reading relative to c is perfectly compatible with c fixing a value for that variable. The situation is not really different from the way in which a modal operator might require us to assess an embedded clause at a possible world other than the world of the context.

This point matters to the issue of what it would mean to treat first-person pronouns as variables analogous to third-person pronouns. For help to clarify how we could simultaneously say: (i) all admissible assignments for a given context c map the variable I to the speaker at c; but also (ii) occurrences of I admit of bound readings at c.

Kratzer is certainly correct that the semantic value she mentions for I, labeled (b) above, presents a problem. It anchors the denotation of I to c, so its denotation cannot shift unless context shifts. What we might do instead is bring the semantics closer to that of an ordinary variable—along the lines of:

$[\![\mathbf{I}_1]\!]^{c,g} = g(1)$ if $g(1)$ is a single person, undefined otherwise.

—and then move the usual requirement that I picks out the speaker to the post-semantic bridge principle, relocating it from the lexical entry for the word. This is essentially the proposal of Santorio [2010]. Let me describe his basic idea. If first-person pronouns are variables, then if we imagine that certain indices are only carried by first-person pronouns—suppose 1 is such an index[17]—then just as we lay it down that:

$t_c :=$ the time of context c

$w_c :=$ the world of context c

when we are explaining how to interpret a bridge principle that invokes those things, we can lay it down that:

$g_c(1) :=$ the speaker of c

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binding, as for instance in Heim and Kratzer [1998]. The details don't matter here.

[17]Building on Schlenker [1999, 2011], Santorio [2010] proposes that first-person pronouns are variables whose numeral indices carry a special diacritical marking, and which are evaluated relative to dedicated variable assignment. I am abstracting away from these details (and their empirical motivations).

Thereby we tell part of the story of what g_c is—of how it is supposed to be determined by context. That after all is a story we owed *anyway*, if we go in for the popular idea that there is such a thing as "the variable assignment of the context". But since the first person pronoun is a variable, it is in-principle possible for there to be operators that shift its value.[18]

It is interesting to compare the situation here to the eternalist who also wants temporal operators, and so wants a time index parameter. This eternalist will have a bridge principle such as principle 1 or 3 above, where context is used to fix the value of the time parameter. Such a principle lets the eternalist capture the idea that the content of tensed sentences depends on the time of the context of utterance—even if sensitivity to the context time is *not written into the lexical entry* for any expression. The same kind of story could be told for first person indexicals. With the right bridge principle, we can see how it could be that the content of sentences containing first-person pronouns depends (absent shifting) on the speaker of the context, despite the fact that no lexical entry requires reference to "the speaker of c".

All this might seem like a curious bureaucratic reshuffling of familiar ideas, but part of what is at issue here is the division of labor on the road to the content of sentences containing first-person indexicals. We all know that (outside of unusual cases) I picks out the speaker. But where is the right place to put this aspect of our linguistic competence? Is in the lexical entry for I? Or does that aspect come in the level of the bridge principle which explains how variables receives their (default but shiftable) values from context? If the latter, then binding is in principle possible for these variables without context-shifting operators. Note that if the context-sensitivity of first-person pronouns is parametric, then they are *not indexical*, in our defined sense of 'indexical'.

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[18]There is a slight complication here, owing to the fact that the indices carried by pronouns are to some extent fictions. On the target reading, and *modulo* any purely syntactic constraints on indices there may be, 'He$_5$ is wise, and [every bowler]$_5$ thinks he$_5$ is wise' is serviceable as a representation of the sentence, but so would be 'He$_6$ is wise, and [every bowler]$_5$ thinks he$_5$ is wise' and 'He$_5$ is wise, and [every bowler]$_8$ thinks he$_8$ is wise'—these are *notational variants* (whereas 'He$_4$ is wise, and [every bowler]$_5$ thinks he$_6$ is wise' corresponds to a different reading). Strictly speaking, a reading of a sentence fixes an (infinite) set of permissible indexings of the index-bearing elements, and context fixes a (perhaps partial) variable assignment only relative to some permissible way of allocating indices—to a choice of notational variant. Thus if Φ is the set of notational variants of ϕ, then what context supplies is not a particular variable assignment, but rather a function from Φ to variable assignments (cf. Ninan [2012a, 29, fn. 42]). The important thing is just that the first person pronoun receive a distinctive sort of variable or variable index, so that it can be identified across notational variants in the post-semantic bridge principle. (Thanks here to Dilip Ninan.)

7 Monsters

If we have operators for shifting indexicals, do we have monsters? There are alternative legitimate senses of 'monster' in the literature, as for instance Schlenker [2011], Rabern [2013], Rabern and Ball [2019], Stalnaker [2014], Santorio [2019] bring out. Let's separate three notions in particular:

1. *Context-shifting* operators. The kind of operator shifts the context parameter, understanding the context parameter along the lines of Lewis [1980].[19]

2. *Indexical-shifting* operators. The kind of operator that shifts the dimension(s) of evaluation which some or all the things traditionally called 'indexicals' are sensitive to, especially the first person and second person pronouns.

3. *Content-shifting* operators. The kind of operator that shifts a content-fixing dimension of evaluation.

These are all conceptually different things, though they may coincide, or stand in various entailment relations, in specific frameworks under specific assumptions; they all make sense; and for each, we can ask whether they are ever realized in any natural language. The recent empirical literature generally uses 'monster' to mean either a context-shifting operator or an indexical shifting operator (Schlenker [2003, 2011], Anand and Nevins [2004], Anand [2006], Santorio [2010, 2012]).

Content shifters are what Rabern and Ball [2019] call *content monsters*, and they correspond to the notion of monster identified in Rabern [2013]. What is the motivation for this interpretation of 'monster'? Rabern fixes on the important point that Kaplan's prohibition on monsters is traceable to his assumption that the content of a sentence in context is a function of the contents of its component parts in that context (an idea in turn animated partly by his ideology of direct reference). This assumption about the compositionality of content is not compatible with the existence of operators that shift content fixing parameters, for the sort of reasons reviewed already in sections 4 and 5. Parametric context-sensitivity—which exists whenever there are content-shifting operators—is an obstacle to seeing compositionality as operating anywhere other than at the level of (context-independent) semantic values. On Rabern's reading of Kaplan, monsters are the sort of operators which would disrupt the compositionality of content. (That perhaps is what is monstrous about them.)

If within our Lewisian two-dimensional setting the Kaplan bridge principle is assumed along with his semantics for the things traditionally called indexicals,

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[19]This is close to what Rabern and Ball [2019] call a 'formal' monster.

these three notions of monster coincide, a point the discussion in Rabern and Ball [2019] brings out. In such a framework, context-shifters just are indexical-shifters, and nothing could shift indexicals without shifting the context parameter. And while the Kaplan bridge principle implies that there are no content-fixing *indices*, the context dimension of evaluation is itself content-fixing in the relevant sense, inasmuch as its value is not abstracted over, like a content variable parameter; instead it enters into the determination of content. So in such a setting, the only sort of thing that could function as a content-shifting monster is an operator that shifts the context. No surprise, then, that these operators were slow to be distinguished. But once we drop these two assumptions, these operators can all come apart. There might be content-shifting operators, but no indexical shifters or context shifters; or there might be indexical shifters, but no context shifters. If we have something like Santorio's semantics for the things traditionally called indexicals, there might even be context shifters but no indexical shifters.

We might think of the above list as ordered by decreasing exoticness. Content-shifting operators are ubiquitous—at least as ubiquitous as ordinary quantifiers. Indexical shift is more rare, but seems to exist, perhaps even in English. True context-shifting perhaps remains unattested—the issue here is about whether the seeming examples can't instead be understood along the lines of assignment-sensitive indexical shift, a matter in turn tied up with the status of the context parameter (about which more in section 8).

Since we can distinguish these three kinds of operator, it is a terminological question which (if any) to call *monsters*. If one approaches this as a question of Kaplan exegesis, Rabern [2013], Rabern and Ball [2019] make a strong case for identifying monsters with content-shifting operators. On the other hand, 'monster' seems now to have taken on a life of its own. Given that so much of the discussion of monsters in the recent empirical literature is tied up with the interpretation of indexicals, and given that the term conjures the idea of something rare or out of the ordinary (not something present virtually everywhere there is variable binding), it seems more consonant with contemporary usage to reserve 'monster' for operators which are either context-shifters or indexical shifters.[20] Then again, since we can speak more exactly in terms of

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[20]Rabern and Ball [2019] seem to be skeptical about the interest of indexical shifters. Discussing a definition of 'monster' along such lines, they write:

But this definition is completely uninteresting given that the set $\{I, you, ...\}$ is stipulative. Why is it interesting that there are operators that shift the extension of expression in that class? We need to be told something about the expressions in that class in order for the ban on monsters to have any substance. (414)

But one might think it goes without saying that the first and second person pronouns correspond to an important and natural class of context-sensitive expressions, expressions which are fascinatingly difficult to bind as compared to the third person pronouns. The class is

context-shifting, indexical-shifting, or content-shifting operators as necessary, it's perhaps even more tempting to just drop talk of monsters altogether.

Let me turn to the idea of a context-shifting operator. Is there something conceptually problematic about this idea? You might think so if you think: "If it shifts, then *ipso facto* it's part of the index". But that would be mistaken. Context-shifting operators, understood as distinct from index-shifting operators, are logically possible things. If they don't seem possible, you may be confusing semantic and post-semantic levels. What is true that the only context that ever matters to a bridge principle is the context of utterance—the matrix context for the whole sentence. One should not confuse the post-semantic role of context in the bridge principle (where talk of "shifting" makes no real sense) with the possibility of compositional semantic context-shifting (which is perfectly intelligible, if perhaps exotic or unattested). If you confuse these roles, you might think context-shifting operators are impossible, when they aren't.

Lewis might seem to have a different view of this matter when he says that "contexts are no substitute for indices because contexts are not amenable to shifting" [Lewis, 1980, 88]. He is often read as stipulating that contexts do not shift by definition (see for instance Schlenker [2011], Stalnaker [2014]). But I read him as making an empirical assumption about the grammar of natural languages like English, not as stipulating a conceptual truth about the meaning of 'context parameter'. Recall the paper is about what it takes to define truth-in-English. He argues, following Cresswell [1972], that the dependence of truth on context is, a matter of empirical fact, "surprisingly multifarious", that many of these sensitivities to context seem, as a matter of empirical fact, not in fact shiftable by operators, and that the hypothesis that there is an non-shifting context parameter with "countless features" could be used to model these multifarious sensitivities in a compact way. As I read Lewis, what is key to contexts is not their unshiftability but rather their multitude of features. The difference between context and index is that "indices but not contexts *can be shifted one feature at a time*" (italics mine)—not that, by definition, contexts don't shift.

8   The status of the context parameter

But one might have a very different reason for doubting that there could be context-shifting operators. This worry is not about their being conceptually problematic. Rather, the worry is that the context parameter, understood along Lewisian lines, isn't necessary, because *all* context-sensitivity is, as a matter of

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even more natural if there are operators which specialize in shifting them. Rabern and Ball seem to suggest that insofar as such operators are interesting, it is because they would belong to the broader class of content-shifting operators. Of course it's notable if an operator is content-shifting; but given that ordinary quantifiers are content-shifting, it's not *that* notable. Indexical shift, on the other hand, seems clearly more notable than that.

empirical fact, parametric. Lewisian contexts enter into the story, not at the compositional semantic level, but rather at the post-semantic stage. So there is no context parameter. *A fortiori* there are no context-shifting operators.

This view of the place of context in semantics is defended by Santorio [2019]. There are a few ways we could state this view. Suppose we keep the definition of indexicality supplied at the end of section 2, which says that an indexical is any expression whose semantic value is a nontrivial function of the context parameter. Then the idea is:

Anti-indexicality. No expressions are indexical.

Of course, the expressions traditionally called 'indexicals' still exist, but the idea is that their context-sensitivity is parametric, and therefore they don't exhibit the sort of indexicality theorized by Kaplan. We might also put it this way:

Context-sensitivity is parametrized. All context-sensitivity is parametric.

How can there be parametric context-sensitivity without a context parameter? How can context fix the values for the content-fixing indices if we've eliminated contexts from the compositional semantics? There is no problem here, for context was already doing its content-fixing work at a post-semantic level of description. To illustrate, consider again our first bridge principle:

Bridge principle 1.

The content of ϕ in c is $\{w : \llbracket\phi\rrbracket^{c,w,t_c,x_c,y_c,z_c} = 1\}$

In Santorio's brave new context-free world, the closest bridge principle looks like this:

Bridge principle 1*.

The content of ϕ in c is $\{w : \llbracket\phi\rrbracket^{w,t_c,x_c,y_c,z_c} = 1\}$

That's not a very difficult adjustment. The difference is just that our compositional semantic values are no long two-dimensional intensions—the context parameter is gone, and instead we assume an ordinary multiple indexing semantics. (Thus this brave new world is really the pre-Kaplan age of Lewis [1970], Scott [1970].) To go this route is to exit the two-dimensional sandbox we have been in for most of the paper, but it doesn't require traveling far. As Santorio notes, we can define truth at a context and entailment in the post-semantics along a similar pattern, differing from our earlier definitions just in the absence of one superscript.

The possibility of this view raises the question: why exactly do we need a context parameter? I agree with Santorio [2019] and Rabern and Ball [2019] that

most of the traditional motivations fail. Is it secured by the alleged unshiftability of the things traditionally called indexicals? No: their context-sensitivity could yet be parametric (and anyway the allegation is still under investigation). Is it motivated by "double-indexing" phenomena? No: that would prove too much, as the last paragraph of Lewis [1980] already hints; double-indexing phenomena at best call for more indices. Is a context parameter necessary to secure 'I am here now' as a logical truth? It is not, as Santorio [2019] explains. More grandly, is a context parameter necessary to preserve the idea that compositionality resides at the level of content? That idea wasn't going to work out anyway, as Rabern [2013] showed. A context parameter may be pretty handy for some of these things, but it is hardly forced upon us.

The final reason I will consider for recognizing a context parameter is the one mentioned at the end of the last section. This is the idea that a context parameter is needed to handle the "multifariousness" of contextual influence. This idea deserves more examination. One of Lewis's examples is:

(11) Fred came floating up through the hatch of the spaceship and turned left.

Drawing on a lecture in Fillmore [1997], he warns: "... it matters what point of reference and what orientation we have established. Beware: these are established in a complicated way... They need not be the location and orientation of the speaker, or of the audience, or of Fred, either now or at the time under discussion" (82). Lewis is right that this sentence is replete with difficulties of contextual resolution. But he might have said more about why exactly the difficulties motivate a context parameter specifically. Deictic reference with *he* is also established in a complicated way, but for all that it seems possible to model its context-sensitivity as parametric. I take it one of Lewis's main worries is that the relations of *comparative salience* and of *relevance* in context, which apparently play an important role in fixing the content of many context-sensitive sentences, are fixed in a holistic manner, depending on multifarious features of the context. But the question is, even granting that salience and relevance are fixed by the features of a context in a holistic way, why think this fixing can't take place at a post-semantic level?

A context parameter is required in the compositional semantics only if there are expressions which exhibit non-parametrizable context-sensitivity (whatever that would be). Say that a *deep* indexical is an indexical whose context-sensitivity could never be mirrored perfectly by a parametric counterpart. If there are deep indexicals, then we need a context parameter.

The question whether there are such expressions seems to tie in with long-standing debates at the semantics-pragmatics boundary about pragmatic enrichment (for overviews, see Stanley [2005b], Recanati [2012]). To chew over just one example, consider a modification of a famous case due to Travis (Travis [1994, 1997]):

(12) Every leaf is green.

Travis draws out the potential for a rather intricate level of context-sensitivity. His story, slightly adjusted:

> Pia's Japanese maple is full of russet leaves. She paints them green. She reports, 'That's better. Every leaf is green.' A botanist friend then phones, seeking green leaves for a study of green-leaf chemistry. 'You can take some from my tree,' Pia says. 'Every leaf is green.'

(See Travis [1997, 89].) Travis would say: the first time Pia says 'Every leaf is green', she speaks truly; the second time, she speaks falsely. We have what looks like contextual variation in the intension of *green*, but it is at least hard to see what the missing parameter is, such that resolution of this parameter finishes the job of selecting the set of green things at an arbitrary world. One might have the feeling that one brings one's understanding of the full contextual situation to bear on how to resolve *green* in context—that it isn't just one or two discrete and parametrizable features of context that come into play. And there is pressure to resolve this context-sensitivity pre-semantically rather than post-semantically, in order that the appropriate property be ascribed to each of the relevant possible values of the bound variable in the quantified sentence. All this might hint that deep indexicality is to be found, not in the things traditionally called indexicals, but rather in open class expressions like *green*.

It would be interesting if one or more of the sorts of cases typically discussed under the heading 'pragmatic enrichment' or 'radical contextualism'— Travis-like cases, noun-noun compounds, metonymy, genitive/posessive case, non-literality, and the like—provided the best case for deep indexicality, and therefore a rationale for a specifically *two*-dimensional semantics. But of course, any claim that something is a deep indexical reads as an invitation to just try harder to parametrize it. (See Szabó [2001] for what could be read in retrospect as a parametrically contextualist analysis of *green* answering to Travis.) There is a whack-a-mole quality to this debate; one has to consider the examples case by case.

So that is one potential source of motivation for the context parameter: deep indexicals. Are there others? Even if there are no uncontroversial examples of deep indexicals, one might think that we could reach a point where the variety and heterogeneity of parameters that would be necessary for a language fragment starts to look like too much as compared to a system with a context parameter. Imagine a language that has all sorts of context-sensitive expressions which are not shiftable by any operators already in the language. So we have a language with a range of expressions we could in principle model parametrically or indexically. Suppose now you face a choice between two systems that make all the same predictions about the usual sorts of data for this language (entailment,

consistency, and the like): (i) a context-free semantics with a dozen indices, or (ii) a semantics with a context parameter and only two index parameters. Is there a conceptual reason to think (i) gets at the truth better than (ii)? If there is, we have not uncovered it here.

If a language contains a heterogeneous group of de facto unshiftable context-sensitive expressions, it may seem simpler to model this context-sensitivity with a single catch-all context parameter than with a context-free semantics having a dozen indices. But even if one has a catch-all context parameter, the semantics still has to capture what feature of context matters for each context-sensitive expression accessing that parameter. That information will go into the lexical entries for the relevant expressions, rather than in the bridge principle (as it does on the context-free approach). But if the semantics does that, it makes just the sorts of distinctions between features of context that a context-free but index-rich competitor semantics would make. The theories make the same range of distinctions, though they put the bump under the rug in different places.

Is there a fact of the matter about where the bump is? The issue that separates the two approaches is about whether the context-sensitivity of the relevant expressions is directly packed into their lexical semantics—indexical— or whether they instead inherit it from their sensitivities to content-fixing index parameters. In certain cases it may be reasonable to wonder whether this is a distinction without a difference. If there is no shifting of the sort that would clearly motivate a parametric treatment, and no deep indexicality calling for a context parameter, it is not obvious that one or the other of these approaches has presumptive status. Teasing out a predictive difference between these formulations might require hypothesizing more about how things like the lexicon and the structure of indices connect to data of broader sorts—say, facts of language change, or of acquisition.[21]

9 Closing

Context-sensitivity that comes by way of index parameters is an important category. To describe it correctly, we must make adjustments to usual definitions of 'context-sensitive'. Its existence, we saw, is an obstacle to viewing the content of a sentence in context as determined compositionally. Shifters of the parameters that give rise to parametric context-sensitivity are monsters, in the sense identified by Rabern. Context-sensitive phenomena traditionally modeled indexically can often be handled parametrically instead, as we saw with first-person pronouns. Seeing this prompts one to wonder about the justification for

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[21]Since one has to acquire both the semantic values of the lexical items and also the appropriate bridge principle, different views about how context-sensitivity is divided between these two dimensions might make for different predictions about patterns of acquisition.

indexical analyses in a fresh way. Why not think that all context-sensitivity is parametrized, hence that there is no indexicality? Maybe we can, if there is no deep indexicality. To do that is say goodbye to the context parameter, and to the two-dimensional setting. Should we go context-free whenever we can, even if not all the context-sensitivity we observe is (de facto) shiftable? Whether such a theory would be simpler, and therefore better, is not clear. It might depend, both on the particulars of the language, and also on whatever else we can figure out turns on the decision to put the context-sensitivity of an expression into the lexicon rather than into the bridge principle.

References

Pranav Anand. *De De Se*. PhD thesis, Massachusetts Institute of Technology, 2006.

Pranav Anand and Andrew Nevins. Shifty operators in changing contexts. *Proceedings of SALT XIV*, 2004.

Seth Cable. Binding local person pronouns without semantically empty features. MIT, 2005.

Herman Cappelen and Ernest Lepore. *Insensitive Semantics: A defense of semantic minimalism and speech act pluralism*. Blackwell Publishing, Malden, MA, 2005.

Maxwell J. Cresswell. The world is everything that is the case. *Australasian Journal of Philosophy*, 50(1):1–13, 1972.

Maxwell J. Cresswell. *Entities and Indices*. Kluwer Academic Publishers, 1990.

Samuel Cumming. Variabilism. *The Philosophical Review*, 117(4):525, 2008.

David R. Dowty, Robert E. Wall, and Stanley Peters. *Introduction to Montague Semantics*. D. Reidel Publishing Company, 1980.

Michael Dummett. *Frege: Philosophy of Language*. Harvard University Press, Cambridge, MA, 2nd edition, 1973.

Charles J. Fillmore. *Lectures on Deixis*. CSLI Publications, 1997.

Allan Gibbard. Two recent theories of conditionals. In W. Harper, R. Stalnaker, and G. Pearce, editors, *Ifs: Conditionals, belief, decision, chance, and time*, pages 211–47. D. Reidel, 1981.

Irene Heim. *The Semantics of Definite and Indefinite Noun Phrases*. PhD thesis, University of Massachusetts, 1982.

Irene Heim and Angelika Kratzer. *Semantics in Generative Grammar*. Blackwell, Malden, Massachusetts, 1998.

David Kaplan. Demonstratives. In Joseph Almog, John Perry, and Howard Wettstein, editors, *Themes from Kaplan*, pages 481–563. Oxford University Press, Oxford, 1977/1989.

David Kaplan. Afterthoughts. In Joseph Almog, John Perry, and Howard Wettstein, editors, *Themes from Kaplan*, pages 565–614. Oxford University Press, 1989.

Jeffrey C. King. Tense, modality, and semantic values. *Philosophical Perspectives*, 17: 195–245, 2003.

Angelika Kratzer. What 'must' and 'can' must and can mean. *Linguistics and Philosophy*, 1:337–55, 1977.

Angelika Kratzer. Making a pronoun: Fake indexicals as windows into the properties of pronouns. *Linguistic Inquiry*, 40(2):187–237, 2009.

David K. Lewis. General semantics. *Synthese*, 22(1-2):18–67, 1970.

David K. Lewis. Index, context, and content. In S. Kanger and S. Ohman, editors, *Philosophy and Grammar*, pages 79–100. D. Reidel, Holland, 1980.

John MacFarlane. Future contingents and relative truth. *The Philosophical Quarterly*, 53(212):321–336, 2003.

John MacFarlane. Nonindexical contextualism. *Synthese*, 166(2):231–250, 2009.

John MacFarlane. *Assessment Sensitivity: Relative Truth and its Applications*. Oxford University Press, 2014.

Richard Montague. Universal grammar. *Theoria*, 36(3):373–398, 1970.

Dilip Ninan. Semantics and the objects of assertion. *Linguistics and Philosophy*, 33 (5):355–380, 2010.

Dilip Ninan. Counterfactual attitudes and multi-centered worlds. *Semantics and Pragmatics*, 5(5):1–57, 2012a.

Dilip Ninan. Propositions, semantic values, and rigidity. *Philosophical Studies*, 158 (3):401–413, 2012b.

Ethan Nowak. No context, no content, no problem. *Mind and Language*, forthcoming.

Barbara Partee. Binding implicit variables in quantified contexts. In B. Music C. Wiltshire and R. Graczyk, editors, *Papers from CLS 25*, volume 25, pages 342–356, Chicago, 1989. Chicago Linguistics Society.

Willard V. Quine. *Word and Object*. MIT Press, Cambridge, MA, 1960.

Brian Rabern. Against the identification of assertoric content with compositional value. *Synthese*, 189(1):75–96, 2012a.

Brian Rabern. *Monsters and Communication: The Semantics of Contextual Shifting and Sensitivity*. PhD thesis, Australia National University, Canberra, 2012b.

Brian Rabern. Monsters in Kaplan's logic of demonstratives. *Philosophical Studies*, 164(2):393–404, 2013.

Brian Rabern. A bridge from semantic value to content. *Philosophical Topics*, 45(2): 181–207, 2017.

Brian Rabern and Derek Ball. Monsters and the theoretical role of context. *Nous*, XCVIII(2):392–416, 2019.

François Recanati. *Literal Meaning*. Cambridge University Press, 2004.

François Recanati. Pragmatic enrichment. In *The Routledge Companion to the Philosophy of Language*, pages 67–78. Oxford University Press, 2012.

François Recanati. From meaning to content: Issues in meta-semantics. In Derek Ball and Brian Rabern, editors, *The Science of Meaning*, pages 113–137. Oxford University Press, 2018.

Hotze Rullman. First and second person pronouns as bound variables. *Linguistic Inquiry*, 35(1):159–168, 2004.

Paolo Santorio. Modals are monsters: on indexical shift in English. In *Semantics and Linguistic Theory*, volume 20, pages 289–308, 2010.

Paolo Santorio. Reference and monstrosity. *Philosophical Review*, 121(3):359–406, 2012.

Paolo Santorio. Context-free semantics. *Oxford Studies in Philosophy of Language*, 1: 208–239, 2019.

Philippe Schlenker. Propositional attitudes and indexicality: A cross-categorial approach. 1999.

Philippe Schlenker. A plea for monsters. *Linguistics and Philosophy*, 26:29–10, 2003.

Philippe Schlenker. Indexicality and de se reports. In Klaus von Heusinger, Claudia Maienborn, and Paul Portner, editors, *Semantics: An International Handbook of Natural Language Meaning*, volume 2, pages 1561–1604. Mouton de Gruyter, Berlin, 2011.

Dana Scott. Advice on modal logic. In K. Lambert, editor, *Philosophical Problems in Logic*, pages 143–173. Reidel, Dordrecht, 1970.

Krister Segerberg. Two-dimensional modal logic. *Journal of Philosophical logic*, 2(1): 77–96, 1973.

Robert Stalnaker. Indicative conditionals. *Philosophia*, 5(3):269–286, 1975.

Robert Stalnaker. Assertion. In Peter Cole, editor, *Syntax and Semantics 9: Pragmatics*, pages 315–332. Academic Press, 1978.

Robert Stalnaker. *Context*. Oxford University Press, Oxford, 2014.

Jason Stanley. Rigidity and content. In Richard G. Heck Jr, editor, *Language, Thought, and Logic: Essays in honor of Michael Dummett*, pages 131–156. Oxford University Press, Oxford, 1997.

Jason Stanley. *Knowledge and Practical Interests*. Oxford University Press, 2005a.

Jason Stanley. Semantics in context. In Gerhard Preyer and Georg Peter, editors, *Contextualism in Philosophy: Knowledge, Meaning, and Truth*, pages 221–253. Oxford University Press, 2005b.

Shane Steinert-Threlkeld. *Communication and Computation: New Questions About Compositionality*. PhD thesis, Stanford University, Stanford, CA, 2017.

Una Stojnić. On the connection between semantic content and the objects of assertion. *Philosophical Topics*, 45(2):163–180, 2017.

Zoltán Gendler Szabó. Adjectives in context. *Pragmatics and Beyond New Series*, pages 119–146, 2001.

Charles Travis. On constraints of generality. In *Proceedings of the Aristotelian Society*, volume 94, pages 165–188. JSTOR, 1994.

Charles Travis. Pragmatics. In Bob Hale and Crispin Wright, editors, *A Companion to the Philosophy of Language*, pages 87–107. Blackwell, 1997.

Seth Yalcin. Semantics and metasemantics in the context of generative grammar. In Alexis Burgess and Brett Sherman, editors, *Metasemantics*, pages 17–54. Oxford University Press, Oxford, 2014.

Seth Yalcin. Modalities of normality. In Nate Charlow and Matthew Chrisman, editors, *Deontic Modality*, pages 230–255. Oxford University Press, 2016.

Seth Yalcin. Belief as question-sensitive. *Philosophy and Phenomenological Research*, XCVII(1):23–47, 2018a.

Seth Yalcin. Semantics as model-based science. In Derek Ball and Brian Rabern, editors, *The Science of Meaning*, pages 334–360. Oxford University Press, 2018b.

Juhani Yli-Vakkuri. Propositions and compositionality. *Philosophical Perspectives*, 27 (1):526–563, 2013.