



Spatial Indexicals

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Abstract

This paper offers a theory of spatial indexicals like *here* and *there* on which such expressions are variables associated with presuppositional constraints on their values. I show how this view handles both referential and bound uses of these indexicals, and I propose an account of what counts as the location of the context on a given occasion. The latter is seen to explain a wide range of facts about what the spatial indexicals can refer to.

1 Introduction

A number of expressions in natural languages are context-sensitive. Among these, the paradigmatic examples are the so-called *indexicals*. This category includes (at least) the following types of expressions:

Personal pronouns: *I, me, you, she, we, them, ...*

Temporal adverbs: *now, then, today, yesterday, ...*

Spatial adverbs: *here, there, hither, ...*

At the broadest level, such words are used to locate oneself in relation to one's spatial and temporal environment (and *vice versa*).

Few would deny that, because the world is given to us from a point of view, or perspective, we need to be able to think and talk indexically. To cite a canonical passage, this is the truism that was captured by Evans (1982) as the sense in which,

The subject conceives himself to be in the centre of a space (at its point of origin), with its co-ordinates given by the concepts 'up' and 'down', 'left' and 'right', and 'in front' and 'behind'. (Evans 1982, 154)

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In an equally often cited passage, Dennett (1987) brought out the intuitive sense in which indexicality in language mirrors this egocentricity of subjectivity:

Indexicality of sentences appears to be the linguistic counterpart of that relativity to a subjective point of view that is a hallmark of mental states [...]. (Dennett 1987, 132)

From a linguistic point of view, the classic theory of indexicality was given by Kaplan (1989b) in his seminal work "Demonstratives." The central idea in Kaplan's theory was that the value of an indexical depends in a direct and systematic way on features of the context of utterance. By a context of utterance we mean a collection of linguistically relevant facts about the situation in which the utterance is made – in particular, who is speaking, when, and where. For instance, in Kaplan's system the value of *I* was the person speaking, the value of *here* was the location where the utterance took place, and so on.¹

For the personal pronouns, this approach is *prima facie* in tension with the observation that pronouns have *bound* uses. This is most clear in the case of 3rd person pronouns, as in (1).

- (1) Every karate teacher thinks she is the best.

On the bound reading, *she* is not referential: it does not refer to anyone in particular. Kaplan's own attitude was to disregard bound uses:

These words have uses [i.e. the bound ones] other than those in which I am interested (or, perhaps, depending on how you individuate words, we should say that they have homonyms in which I am not interested). (Kaplan 1989b, 489)

Instead, the theory in "Demonstratives" was only directed at referential uses of indexicals.

At the same time, from within a neighboring, indeed overlapping, tradition, the tension between pronouns as referential and pronouns as bound has largely been resolved by theories that treat pronouns as *variables* that can be free (referential) or bound.² On this approach,

the difference between referential and bound-variable pronouns resides in the larger surrounding LF [i.e. logical form] structure, not in the pronouns themselves. (Heim and Kratzer 1998, 242)

My aim in this paper is to, first, argue that there are equally good reasons to treat the spatial indexicals – in English, chiefly, *here* and *there* – in the same way, and second, sketch a way of doing so. As such, I am focusing mainly on developing a linguistic theory of the spatial pronouns. Even so, I hope it will become apparent that there are

¹ Kaplan (1989b) treated temporal indexicals like *now* and *yesterday* as sentential operators. I do not discuss temporal indexicals in this paper.

² Cf. e.g. Cooper (1983); Kaplan (1989a); Heim and Kratzer (1998); von Stechow (2003); Heim (2008); Sauerland (2004, 2008b); Stokke (2010, 2022); Sudo (2012).

ramifications for how we should understand spatial indexicals in relation to issues concerning perspective and point of view in our talk and thought.

Section 2 shows that, contrary to orthodoxy, spatial indexicals have both referential and bound uses, and importantly, that the pattern of bound uses parallels that of the personal pronouns in a significant way. In Section 3 I lay out a bare bones theory of personal pronouns as variables, and show how it can be applied to the spatial indexicals. Section 4 provides a way of understanding referential uses of spatial indexicals in relation to a Kaplanian notion of the location of the context.

2 Referential and Bound Uses

2.1 Referential Uses

That both personal pronouns and spatial indexicals have referential uses is obvious, as in these examples:³

- (2) a. I teach karate.
b. She's's our karate teacher.
c. Do they teach karate?
- (3) a. Could you put it here/there on the coffee table?
b. I've got a terrible pain just here/there.
c. I found it behind here/there.

What requires theorizing is the observation that there are constraints on what one can refer to with these expressions that are clearly encoded in their linguistic meaning. Intuitively, we would say that *I* must refer to the speaker, *she* must refer to a female individual, while *they* (in its plural use) must refer to a group of more than one person. Or at least these words must refer to people who are thought of as having these characteristics in the relevant context.

There is a parallel intuitive sense in which *here* is used to refer to the speaker's location. Indeed, this was directly built into Kaplan's treatment. Yet there are two observations to make about this, which complicates the picture, and which we will seek to take seriously in this paper. The first is that cases like those in (3a–c) appear to go against this fundamental Kaplanian idea. For instance, it is hard to understand the coffee table in (3b) as "the location of utterance," and similarly for (3b) and (3c).

The second observation is that, even in cases where the referent of *here* is plausibly described as the location of utterance, there is considerable flexibility in what can count as that location, at the same time as there are clear constraints. This can be seen from (4).

- (4) *Uttered in Paris*: There's so much traffic here in Paris/in France/in Europe/#in Chicago/#in Germany/#in Australia.

³ (3a–c) are taken from Huddleston and Pullum (2002).

In Section 4 I will offer an account that explains all of these data points, and more, concerning the referential uses of spatial indexicals. In the rest of this section, and the next, we will be chiefly concerned with bound uses.

2.2 Bound Uses

The main motivation for treating personal pronouns as variables is that they can be bound in various environments. This is obvious for the 3rd person pronouns, the paradigm of variables in natural language. Take the sentences in (5).

- (5) a. Every karate teacher thinks she is the best.
- b. All the karate teachers think they are the best.
- c. She did her homework, and so did Mike. [sloppy reading]

All of these sentences have uses (or readings) on which the underlined pronoun are bound. By this we mean, at least, that the pronoun is not referential. For instance, on the bound reading of (5a), *she* does not refer to any particular person. Instead, a bound pronoun interacts with the binding phrase to form a property. *She* in (5a), when bound by *every karate teacher*, forms the property of thinking one is the best. Formally, we think of this property as a function that maps individuals onto true if and only if they think they are the best:

$\lambda x. x$ thinks x is the best

(5a) then says that each karate teacher has this property.

The same happens in (5c). The so-called “sloppy” reading is the one according to which both she and Mike did their own homework, as opposed to the “strict” reading on which both she and Mike did her homework. On the standard analysis, *her* in the first conjunct does not refer, but is bound by *she* to form the property of having done one’s homework:

$\lambda x. x$ did x ’s homework

The first conjunct says that *she* has that property, and the second conjunct says that Mike also has this property.

1st and 2nd person pronouns do not allow binding in constructions such as those in (5a–b). Consider (6a–b).

- (6) a. Every speaker has difficulty stopping when I should. (Partee 1989)
- b. Every addressee has difficulty stopping when you should.

You cannot read these sentences as expressing bound readings. For instance, you cannot understand (6a) as saying that each speaker x has difficulty stopping when x should. Instead, you can only read it as saying, weirdly, that each speaker has difficulty stopping when the speaker of (6a) should. And similarly for (6b).

Yet, paralleling (5c), 1st and 2nd person pronouns likewise occur bound in sloppy readings of ellipsis cases, as in (7).⁴

- (7) a. I did my homework, and so did you. [sloppy reading]
- b. You did your homework, and so did I. [sloppy reading]

Take (7a). Analogously to (5c), *my* in (7a) is bound to generate the property of having done one's homework. The first conjunct says that *I* have that property and the second conjunct says that *you* have that property, too. In other words, the sloppy reading of (7a) says that the speaker and addressee each did their own homework.

The personal pronouns, then, all have bound uses. Yet there is a pattern. Namely, only the 3rd person pronouns can be bound in the "obvious" ways, as in (5a–b), whereas 1st and 2nd person pronouns only allow binding in other kinds of constructions, as in (7).

It has not been recognized that *here* and *there* fit this pattern exactly:

- (8) a. Whenever Fred goes to a new restaurant, he leaves his jacket there.
- b. Whenever Fred goes to a new restaurant, he leaves his jacket here.
- c. [Uttered in Liverpool:] Fred had a special speech prepared for each town on his campaign trail. But he got confused. Here he gave the speech he was supposed to give here. In Manchester he didn't. [sloppy reading]

As this illustrates, while *there* can be bound in the same way as the 3rd person pronouns, *here* cannot. Nevertheless *here* can be bound in sloppy readings. In (8a) *there* can be read as not referring to a particular place. Instead, (8a) says, roughly, that each new restaurant that Fred goes to has the property of being a place where Fred leaves his jacket. But in (8b) you can only understand *here* to refer to the place of utterance. (As if whenever Fred tries a new restaurant, he first stops off at the speaker's house and leaves his jacket.) By contrast, you can understand (8c) as saying that Liverpool is a place where Fred gave the speech he was supposed to give at that place while Manchester is not such a place.

So the pronouns and the spatial indexicals all have referential and bound readings. And moreover, the pattern of bound uses of spatial indexicals parallels that of the pronouns. This motivates a corresponding treatment. We turn to this in the next section.

3 Variables and Presuppositions

3.1 Referential Pronouns

In the tradition originating in the work of Cooper (1983), pronouns are seen as variables encoding *presuppositions* that constrain their values. I will lay out the main parts of one way of developing this kind of framework, which is a simplified version of the kind of theory that is found in Heim and Kratzer (1998); von Stechow (2003); Heim (2008); Sauerland (2004, 2008b), and other work in this area.

⁴ See Heim (2008, 45–46) for a similar observation.

We think of a pronoun as associated with a variable, written as a numerical index, call it i . So I_i is an occurrence of I whose variable component i needs to be given a value by an assignment. In turn, I_i presupposes that i is the speaker. Similarly, she_i presupposes that i is female.

Formally, we take $\llbracket \cdot \rrbracket^c$, as always, to be a function that assigns denotations (meanings) to logical forms (LFs), relative to a context c . A context c is a tuple $\langle s_c, h_c, t_c, l_c, w_c, g_c \rangle$ of a speaker s_c , a hearer h_c , a time t_c , a location l_c , a world w_c , and an assignment g_c . We then give the following semantics for I and she :⁵

- (9) a. $\llbracket I_i \rrbracket^c = [\lambda x : x = s_c. x](g_c(i))$
- b. $\llbracket she_i \rrbracket^c = [\lambda x : x \text{ is female. } x](g_c(i))$

The function

$$\lambda x : x = s_c. x$$

is a *partial identity function* that takes an individual x as argument and returns the same individual x if and only if x is s_c , the speaker in c .⁶ If x is not s_c , the function is undefined: it returns nothing. And analogously for she_i :

$$\lambda x : x \text{ is female. } x$$

is a function that maps any x onto itself if and only if x is female.

We think of g_c as representing the factors of an utterance situation that determine reference. Depending on one's preferred theory, one might think that g_c represents the speaker's intentions, or the audiences' idea of what is referred to, or the result of a complex, perhaps inscrutable interplay of factors. We do not have to take a stand on this here. (I will comment briefly on this again later.)

To illustrate how this system works, consider (10), as uttered by Malwina.

- (10) *Malwina*: I_1 teach karate.

In this case we assume that the context determines Malwina as the value of 1. She is certainly the intended referent, and presumably also who the audience think the referent is. So in this case $g_c(1)$ is Malwina. But moreover, Malwina is the speaker in c : Malwina is s_c . So the presupposition is satisfied, and I_1 refers to Malwina.

By contrast, consider

- (11) *Trump pointing to Giuliani*: She_1 's a genius.

In this case the context determines Giuliani as the value of 1: $g_c(1)$ is Giuliani. He is clearly the intended referent and is also most likely who the audience would take to be the referent. However, since Giuliani is not female, the presupposition is not satisfied,

⁵ This ignores a number of features of these pronouns, including number, in both cases, and the 3rd person feature of *she*. These, and more, can be built into the framework I outline here without further complications.

⁶ This follows the standard notation on which the domain of a function is specified after the colon, such that the domain of the function $\lambda\phi : \zeta. \psi$ is specified by ζ .

and so she_1 is undefined (has no referent). In turn, therefore, (11) is equally undefined, that is, neither true nor false.

As seen from this, we are here theorizing about what is typically called *semantic* reference, that is, the sense of reference that is relevant to truth conditions. Even so, one can agree, if one is sympathetic to such views, that Trump speaker-referred to Giuliani, corresponding to the observation that audiences will most likely be able to recover that Trump meant to say that Giuliani is a genius. Indeed, one might see g_c as representing speaker reference, and cases like (10) as ones in which semantic and speaker reference coincide. Yet we set these issues aside here.

There is a central difference between these two pronouns. The presupposition triggered by *I* requires that its value be identical to the speaker of the context, whereas the presupposition triggered by *she* requires that its value be female. The former is a presupposition that imposes a constraint in terms of a parameter of c , the Kaplanian context of utterance. As it is often said, this is an *indexical* presupposition.⁷ By contrast, the presupposition that the value of *she* be female is not a presupposition concerning a Kaplanian parameter, and is therefore not an indexical presupposition. This difference will play a central role in what follows.

3.2 Bound Pronouns

We now turn to how this framework explains the possibilities for binding pronouns that we reviewed in 2.2. In particular, why can *she* be bound in (5a) but *I* cannot be bound in (6a)?

- (5) a. [Every karate teacher]₁ thinks she₁ is the best.
- (6) a. #[Every speaker]₁ has difficulty stopping when I₁ should.

On the approach we are considering here, binding possibilities are explained by the *projection* behavior of the presuppositions triggered by pronouns. By "presupposition projection," we mean the phenomenon by which the presuppositions of compound sentences are determined by those of their parts.

As a rough generalization, presuppositions under universal quantifiers usually project to the domain of quantification. For example, (12) usually presupposes that all the students used to smoke.

- (12) Every student stopped smoking.

So if there were a bound reading of (6a), we should expect the presupposition of the bound first person pronoun to project across the domain, in this case all the speakers quantified over. In other words a bound reading of (6a) would presuppose that each of the speakers is identical to s_c , the speaker of (6a). But since this is an incoherent assumption, there is no bound reading. By contrast, (5a) only presupposes that each of the karate teachers is female, which is arguably the correct result.

⁷ See e.g. Heim (2008); Yanovich (2010); Stokke (2022).

Next, consider the cases in which the first and second-person pronouns can be bound, e.g. (7c).

(7) c. I₁ did my₁ homework, and so did you. [sloppy reading]

As we noted, according to the standard treatment, *my* in (7c) is bound by *I* to form the property

$\lambda x. x$ did x 's homework

This property is applied to *you* under ellipsis to get the sloppy reading on which both the speaker and hearer have this property. But why does the indexical presupposition of *my* not project? Why does (7a) not presuppose that the referent of *you* is the speaker?

The central thought of the theories in von Stechow (2003), Heim (2008); Sauerland (2004, 2008b), and many others is that when a feature of a binder and a bindee *match*, the latter is not interpreted: it is semantically inert. So, for instance, when both the binder and the bindee are 1st person, the 1st person indexical presupposition of the bindee is semantically inert. In other words, it will not be presupposed that the bindee is 1st person.

There is disagreement about the correct theory of this phenomenon. (See also below.) For our purposes, we can assume the following formulation:

Feature Deletion

A feature α is deleted at logical form (LF) from a variable if α is also present on the variable's semantic binder. (After Heim (2005))

Since *my* is bound by *I* in (7a), their 1st person features match. Hence, Feature Deletion entails that the 1st person presupposition of the bound *my* is inert: it is not seen by the semantics. So when we apply $\lambda x. x$ did x 's homework to *you* in the second conjunct, we do not trigger the unwanted presupposition that the referent of *you* is the speaker. By contrast, the presupposition of the 1st person is left in place for *I*, which is not bound, and (7a) does presuppose that the referent of *I* is the speaker, which is the right result.

By contrast, consider (6a). Since *every speaker* is not 1st person, but 3rd person (as can be seen from agreement), the features of *every speaker* and *I* do not match. Hence, the indexical presupposition on *I* remains operative: it is not deleted from the bound *I*. In other words, the bound reading incoherently presupposes that every speaker is identical to s_c .

This explains the difference in binding possibilities. Indeed, it also explains (5c).

(5c) c. She₁ did her₁ homework, and so did Mike. [sloppy reading]

Since the gender features of *her* and *she* match, the presupposition that the referent be female is deleted from the bound *her*. So when the property $\lambda x. x$ did x 's homework is applied to Mike under ellipsis, we do not trigger a presupposition to the effect that Mike is female. This is how the sloppy reading is made possible.

Yet there are reasons to think that not all cases of presupposition triggers in the scope of quantifiers generate presuppositions concerning the entire domain of quantification.⁸ Consider, for example, (13).

(13) A student stopped smoking. (Sudo 2012)

Sudo (2012, 45) notes that (13) does not presuppose that each student in the relevant domain used to smoke. Instead, following Sudo, let us assume that sentences such as (13) generate existential presuppositions: roughly, (13) presupposes (14).

(14) There is at least one student who used to smoke.

In support of this, we can note that (13) is felicitous in a context in which more than one student has been smoking but only one stopped, as well as in a context in which only one student has been smoking.

Now consider (15).

(15) A student did my homework.

No bound reading of *my* is available in this case. It might seem that the kind of explanation we sketched above for cases like (6a) is not applicable here. Given what we assumed for (13), a bound reading of (15) presupposes (16).

(16) There is at least one student who is s_c .

But if (16) is all that would be presupposed, then why is there no bound reading of (15)? After all, (16) is clearly true in the relevant context: the speaker of (15) is herself one of the students.

(16) is arguably a deviant presupposition, even if it is not incoherent like that generated by (6a). In particular, there are independent reasons to follow Heim (1991, 2008); Percus (2006); Sauerland (2004, 2008a, b), and others, in assuming a principle, similar to the Gricean maxims of Quantity, admonishing speakers to make their utterances presuppose as much as possible.⁹ This kind of principle can be formulated in different ways. Here we appeal to Sauerland (2008a) formulation, adapted from Heim (1991):

Maximize Presupposition (Heim 1991; Sauerland 2008a)

Make your contribution presuppose as much as possible!

Maximize Presupposition helps explain some observations concerning indefinites. Consider (17).

(17) A father of the victim arrived at the scene. (Sauerland, 2008a)

⁸ Cf. e.g. Chemla (2009a, b); Beaver (1997, 2001); Schlenker (2008a, b); Sudo (2012)

⁹ For discussion of whether this kind of principle is reducible to Gricean reasoning, see especially Percus (2006) and Schlenker (2012).

Maximize Presupposition explains the oddity of (17), in that (17) does not presuppose that the victim has a unique father. Hence, “the speaker must either assume that the victim does not have a unique father or the speaker must be violating [Maximize Presupposition].” Sauerland (2008a, 585–586) Either way, the utterance is pragmatically deviant.

An analogous explanation can be given for the unavailability of a bound interpretation of (15). If such an interpretation presupposes (16), the speaker does not presuppose that there is a unique student who is s_c , that is, who is herself. The latter is a stronger presupposition than (16), and is of course readily available. Hence, the speaker is violating Maximize Presupposition. At the same time, Maximize Presupposition does not predict that (13) is deviant, since there is nothing problematic in the inference that the speaker of (13) assumes that there is no unique student who used to smoke.

In other words, given a principle like Maximize Presupposition, there are good reasons to think that we can explain the possibilities for binding pronouns at least in a very wide range of cases. Yet before moving on to the spatial indexicals, we should note that the approach just outlined is not the only competitor for explaining these binding facts.

Most prominently, Kratzer (1998, 2009) has proposed another theory according to which some bound pronouns are “fake indexicals” in that they are born without the relevant features to begin with:

when otherwise indexical pronouns end up with a bound variable interpretation, they start their life in syntax as mere indices that pick up the features that make them visible or audible via binding relations in the PF [i.e. phonological form] branch of syntactic derivations. (Kratzer, 2009, 189)

In other words, on this view, at the level of LF, *my* in (7c) is just a variable (or index), while the reason it is pronounced as *my* at PF is due to its having picked up some features of its bindee, simply in order to make it audible at all. But since this is not a phenomenon at the level of LF, there is no need for a story of how an indexical presupposition of *my* can “disappear” semantically under binding.

Yet what I want to point out here is that, given the parallels in the data, whatever one’s theory of the binding facts we have noted above, one should apply the analogous theory to the spatial indexicals. If the binding facts of the 1st and 2nd person are to be explained in terms of fake indexicals, so are the binding facts of *here* and *there*. I will continue to conduct the discussion in the simplified version of the framework that employs Feature Deletion sketched above.¹⁰

3.3 Spatial Indexicals

It is relatively straightforward to give a parallel treatment of spatial indexicals. The central idea is that *here* mirrors the 1st and 2nd persons in triggering an indexical presupposition in terms of l_c , while *there* mirrors the 3rd person pronouns in triggering no indexical presupposition. We spell this out as follows:

¹⁰ Heim (2008) adopts Kratzer’s (1998) approach.

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- (18) a. $\llbracket \text{here}_i \rrbracket^c = [\lambda x : x = l_c. x](g_c(i))$
 b. $\llbracket \text{there}_i \rrbracket^c = [\lambda x : x \text{ is a location. } x](g_c(i))$

Given this, we can explain (8a) vs. (8b):

- (18) a. Whenever Fred goes to [a new restaurant]₁, he leaves his jacket there₁.
 b. #Whenever Fred goes to [a new restaurant]₁, he leaves his jacket here₁.

In particular, if there was a bound reading of (8b), it would presuppose that each of the restaurants is l_c , i.e. the location that (8b) is uttered. This is incoherent. By contrast, (8a) only presupposes that each restaurant is a location.

And parallel to the pronouns we also explain (8c).

- (8) c. Fred had a special speech prepared for each town on his campaign trail. But he got confused. Here₁ he gave the speech he was supposed to give here₁. In Manchester he didn't. [sloppy reading]

Since *here* is bound by *here*, their features match, and the presupposition of the bound *here* is deleted. Hence, (8c) does not presuppose that Manchester is l_c .

There are arguably other features of the spatial indexicals that should ultimately be taken into account. Most conspicuously, both *here* and *there* are singular, as is seen from agreement:

- (19) a. Here is/#are where I want to live.
 b. There is/#where I want to live.

The focus of the present discussion is on the contrast between indexical presuppositions and the absence of such presuppositions, as in (18). In the next section, we will see how indexical presuppositions influences referential uses of spatial indexicals.

4 Referential Uses and Co-Nesting

4.1 What is the Location of the Context?

We have seen that treating the spatial indexicals analogously to the pronouns as variables carrying presuppositional constraints on their values is motivated by the parallels in binding possibilities. At the same time, this treatment has consequences for how we understand referential – i.e. free, non-bound – occurrences of *here* and *there*.

According to the approach we have sketched, the utterance situation determines a (candidate) referent for *here*_{*i*}, namely $g_c(i)$. In turn, the semantic presupposition of *here*_{*i*} "checks" whether $g_c(i)$ is l_c . If so, *here*_{*i*} refers to $g_c(i)$. If not, *here*_{*i*} is undefined: it does not refer. In other words, according to this semantics, *here*_{*i*} can only (semantically) refer to l_c , just as I_i can only refer to s_c .

However, this does not settle the question of which locations can count as l_c , the location of the context, or what the range of permissible values for l_c is in a given

context. As we suggested in 2.1, while there is considerable flexibility in what *here* can refer to on an occasion, there are also clear constraints on the range of values. This was illustrated by (4).

- (4) *Uttered in Paris*: There's so much traffic here in Paris/in France/in Europe/#in Chicago/#in Germany/#in Australia.

As (4) shows, in this case, l_c can be Paris, France, or Europe, but not Chicago, Germany, or Australia. Why?

It is immediately obvious that all and only the allowed locations include the speaker, as illustrated by Fig. 1 below.

So a first suggestion might be that it is a constraint on l_c that it include the speaker. That is, while one can refer to locations of different sizes with *here*, the referent must be a location that includes s_c .

However, we have already seen that there are examples that do not fit this pattern, as in (this instance of) (3a):

- (3) a. Could you put it here on the coffee table?

Even though many locations include the speaker, the coffee table is not among them, as illustrated by Fig. 2.

Examples like this also bring out that we should not think of l_c as the location of *utterance*, strictly speaking, but rather as the location of the context. If one prefers, one can think of l_c as the indexical location that is relevant to *here* (and presumably more expressions).

Still, we can see that, in Fig. 2, all the locations that include the speaker (the living room, Paris) also include the coffee table. Accordingly, a plausible thought is that l_c must either include s_c or be included in a location that includes s_c . Yet this is not quite right, in that it would allow Germany to be the referent of *here* in (4), since Germany is included in Europe, which includes s_c . Even so, Germany is not included in *all* the locations that include s_c in (4). As I go on to show next, this suggests a way of understanding the constraints on l_c in a way that will capture all the cases.

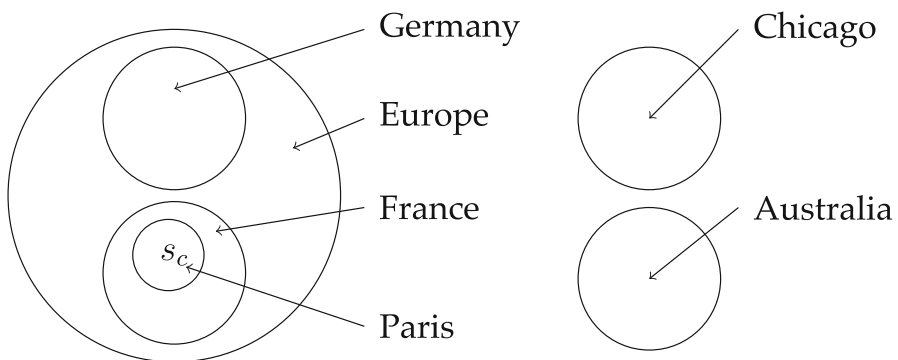


Fig. 1 Context for (4)

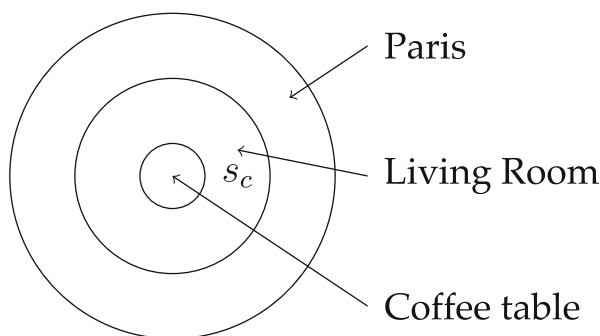


Fig. 2 Context for (3a)

4.2 Co-Nesting

Consider the relation between Paris, France, and Europe in Fig. 1, all of which are permitted referents for *here* in the case of (4). They form a system of locations that include each other, all of which include s_c . Europe includes France, which includes Paris, which includes s_c . And even though Germany is included in Europe, Germany is not part of this system, since France (and hence Paris) and Germany are completely disjoint. Now look at Fig. 2. Again, there is a system of locations that include each other. And even though not all of them include s_c , two of them do. What the two situations have in common, then, is that s_c is included in somewhere, even if not throughout, in the relevant system of locations.

Given this, I suggest that the constraint on *here* is that l_c must be one of a range of locations that is, as I will say, *co-nested* with s_c . More precisely, say that

Co-Nesting

A location l is *co-nested* with an individual x iff for all l' such that l' includes x , either l' includes l or l includes l' .

We assume that all locations include themselves.

Take the instance of (4) where *here* refers to Paris. For any location l that includes s_c , either l includes Paris, namely, France and Europe, or l is included in Paris, namely Paris itself. So Paris is co-nested with s_c . As are France and Europe. Moreover, by the same token, the café that s_c is sitting in, the table she is sitting at, or indeed the northern hemisphere, Earth, the Milky Way, and so on, are all co-nested with s_c . This is the right result. It is easy to check that *here* can refer to all of these locations in this case, and I will refrain from going through these variations.

By contrast, Germany is not co-nested with the speaker in Fig. 1. There are locations that include s_c but which neither include Germany nor are included in Germany, such as Paris and France. The same holds, *mutatis mutandis*, for Chicago and Australia, which are also excluded by not only Paris and France, but also by Europe.

In the case of (3a) the coffee table is included in both the living room and Paris, as illustrated by Fig. 2. So the coffee table is co-nested with s_c . All the locations that include s_c either include or are included by the coffee table. Indeed, in the same context, *here* can also refer to the living room or Paris – even though the latter is odd for

irrelevant reasons – but not, for instance, to a location not included in the living room, say, the kitchen:

- (20) Could you put it here, in the living room/in Paris/#in the kitchen?

Similarly, the place on the speaker's body in the relevant instance of (3b) is co-nested with s_c , since all locations that include s_c trivially includes the place on the body of s_c .

- (3) b. I've got a terrible pain just here.

By contrast, imagine that the speaker's right arm was amputated and placed in another room. In that case, we predict, correctly, that *here* cannot refer to a place on the arm.

So the proposal that l_c must be co-nested with the speaker clearly gets all the cases we have looked at so far right. Certain other examples, though, suggest a refinement to this account. Consider the system of locations in Fig. 3.

Ecuador straddles the boundary between the southern and the northern hemispheres. Yet if the speaker is located in the southern part of Ecuador, it is clear that both Ecuador and the southern hemisphere are permissible values for l_c , but the northern hemisphere is not:

- (21) There's great biodiversity here in Ecuador/in the southern hemisphere/#in the northern hemisphere.

But is Ecuador co-nested with s_c ? It is, if we allow *partial* inclusion (or overlap if you like), in that the southern hemisphere includes part of Ecuador. Further, we make the obvious assumption that if l wholly includes l' , l partially includes l' . So all locations that include the speaker either partially include Ecuador, namely the southern hemisphere, or are partially included in Ecuador, namely Ecuador itself.

Yet even if inclusion can be partial, the northern hemisphere is not co-nested with s_c . There is at least one location that includes s_c but does not partially include the northern hemisphere and is not partially included in the northern hemisphere, namely the

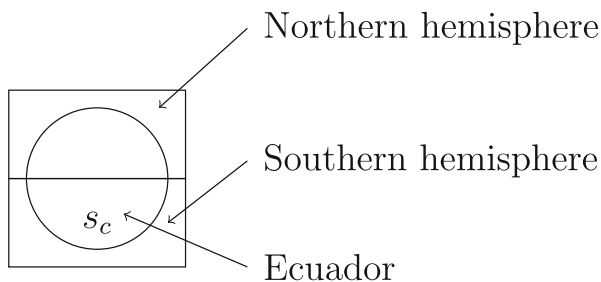


Fig. 3 Context for (21)

southern hemisphere. So we explain why *here* cannot refer to the northern hemisphere in (21).

Next, note that the pattern for *there* in a context parallel to (4) is exactly the opposite of *here*:

- (22) *Uttered in Paris*: There's so much traffic there #in Paris/#in France/#in Europe/in Chicago/in Germany/in Australia.

The same applies, *mutatis mutandis*, to using *there* in cases parallel to (20) or (21). So it looks like *there* requires that its value *not* be co-nested with the speaker. Yet, as I will argue in the next section, it we need to be careful about how precisely to understand this.

4.3 Demonstrative and Anaphoric Uses

Before closing this section, I want to briefly mention two classes of examples that arguably differ significantly from those we have discussed. First, Kaplan (1989b, 491) noted that *here* has what he called "demonstrative" uses, as in his case of (23).¹¹

- (23) In two weeks, I will be here [pointing at a city on a map].

Suppose the city on the map is Barcelona. I follow the standard analysis, according to which what is said by (23) – its truth conditions – is that in two weeks the speaker will be in Barcelona. In turn, the place on the map is used to pick out Barcelona. More particularly, the orthodox treatment of such cases of deferred ostension inherited from Nunberg (1993) holds that, in this case, the place of the map acts as an "index" for the referent, Barcelona.

What is important for our purposes is that, as has been routinely observed since Nunberg (1993), in these cases it is the index that must satisfy the relevant features of the indexical or demonstrative in question. In our terms, it is the place of the map that needs to be co-nested with the speaker, not Barcelona. Indeed, we predict, correctly, that a location that is not co-nested with the speaker cannot be a Nunbergian index in a case of deferred ostension using *here*.

Second, it is well-known that *here* can be used anaphorically, as in these cases:¹²

- (24) a. At the age of twenty-five he had walked into the mission as if he belonged here and had become a Christian.
b. The main stadium was almost finished. Here, on the opening day of the games, participants from every country would parade.

In (24a) *here* refers to the mission, and in (24b) *here* refers to the stadium. Similarly, consider an example discussed by Hunter (2013, 388):

¹¹ Kaplan (loc. cit.) attributes the observation to Michael Bennett.

¹² From Huddleston and Pullum (2002, 1550).

-
- (25) All over England folk began to hear of the wonderful saint who lived alone in the desert island, and from all parts the troubled and unhappy came to seek his help. [...] He built a house by the landing-place on the island for his visitors to stay in, and here, too, his monks would come on festivals to have a talk with him.¹³

As Hunter (2013, 389) says, in these cases, "*here* refers to a location introduced in discourse."

I cannot offer a treatment of anaphoric uses of *here* in this paper. I want to note two points, however. First, a variable-treatment of spatial indexicals is amenable to anaphoric uses in that one can allow that the assignment of values may be determined by factors other than extra-linguistic contextual aspects of the utterance situation, such as the speaker's intentions or the location of utterance.

Second, there is a clear sense in which the co-nesting requirement still applies to anaphoric uses. Namely, we can note that the value of *here*, in these cases, must be co-nested with the location that is denoted by the antecedent of the anaphoric relation. So, for instance, in (24a) the value of *here* must be co-nested with the mission, as can be seen from the following continuations:

- (26) At the age of twenty-five he had walked into the mission as if he belonged here and had become a Christian.
- a. And he would often sit for hours here in the pews.
 - b. And he would often wander around here in the surrounding woods.
 - c. And he would often go to the market #here in the next village.

Given what we have said above, the most straightforward way of accommodating this is to assume that, in these cases, the location of s_c is set to the antecedent of the anaphoric relation. So, for instance, in the case of (26a), s_c is seen as located at the mission, and hence the pews are co-nested with s_c . If one thinks that this is implausible, since the location of s_c should be the location of the actual speaker, one can consider other ways of accounting for such uses. However, I will not pursue this further here.

5 Co-Nesting and Appropriate Contexts

5.1 Co-Nesting and Binding

Given that co-nesting captures the constraints on reference for *here*, it might well be asked whether co-nesting itself is a semantic presupposition of *here*. That is, should we replace $\lambda x : x = l_c. x$ with a co-nesting requirement? There is a strong reason to resist this suggestion. Namely, it will preclude us from explaining a range of binding possibilities.

Consider, for example, (27).

¹³ Underlining added. See Hunter (2013, 388, fn. 10) for the source of this example.

(27) Everytime I put something in [one of these boxes]₁, I forget it #here₁/there₁.

Imagine the situation is as illustrated by Fig. 4, where b_1 – b_3 are the relevant boxes. Each box is co-nested with s_c . So if co-nesting was the presupposition of *here*, the bound reading of (27) should be allowed since it would only presuppose that each box is co-nested. Yet binding is not allowed. However, if the presupposition of *here* is, as we have assumed, that its value be identical to l_c , we get (27) right, since the presupposition that each box is identical to l_c (whatever l_c is) is incoherent.

So we should conclude that co-nesting is not a semantic presupposition of *here*. Correspondingly, we cannot assume that *there* semantically presupposes that its value not be co-nested with s_c . If so, then a bound reading of *there* in (27) should presuppose that each box is not co-nested, and hence be ruled out. So it is implausible that *there* semantically presupposes non-co-nesting.

Finally, we turn to the question of what kind of requirements co-nesting and its parallel are, given that they are not semantic presuppositions.

5.2 Appropriate Contexts

I suggest that, rather than imposing a presuppositional constraint on the value of *here*, co-nesting is a constraint on what is often called *appropriate* contexts. In other words, a context c is appropriate only if l_c is co-nested with s_c . To see what this amounts to consider the corresponding suggestion proposed by Heim and Kratzer (1998), 243, which I label "Variable Resolution," as below.

Variable Resolution

A context c is appropriate for an LF ϕ only if c determines a variable assignment whose domain includes every index free in ϕ .

According to Variable Resolution, a context is appropriate only if it determines a referent for each referential (non-bound) pronoun.

Take the example of (28) discussed by King (2018).

(28) *Out of the blue*: #He₁'s a piece of work.

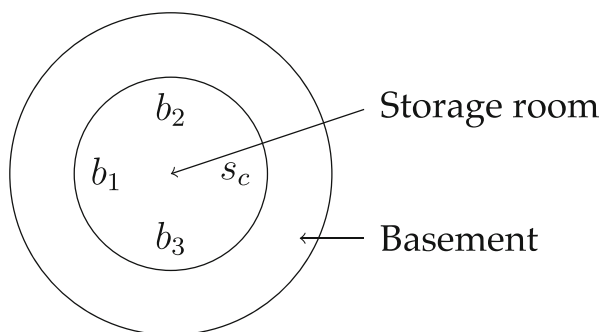


Fig. 4 Context for (27)

What makes (28) infelicitous is that the context does not assign a referent to the pronoun. As we said in 3.1 we are assuming that g_c represents the factors, whatever one thinks they are, of a context that determines the referents of pronouns. So the infelicity of (28) is explained by Variable Resolution, as opposed to cases in which the context does determine a (candidate) referent, but one that violates the gender presupposition of the pronoun.

Given our treatment, Variable Resolution also applies to referential occurrences of spatial indexicals. That is, the context must provide a plausible referent for *here* or *there*, prior to the further constraints imposed by any presuppositions come into play. Consider, for instance, (29)–(30).

(29) *Out of the blue*: #My sister never went there₁.

(30) *At the beer tent at a concert at a festival in Spain*: #My sister's on her way here₁.

In these cases the context does not determine a value for 1, *modulo* what factors of context you think determine reference. Formally, the domain of g_c does not include 1: $g_c(1) = \#$. What I have suggested here is that, just as the context must determine a suitable referent – or equivalently, a suitable assignment g_c – there are constraints on the appropriate values of l_c , at least one of these being that l_c be co-nested with s_c .

Finally, consider again

(22) *Uttered in Paris*: There's so much traffic there #in Paris/#in France/#in Europe/in Chicago/in Germany/in Australia.

As we said, we cannot explain this case by supposing that *there* presupposes that its value not be co-nested with the speaker, even though such a putative presupposition is indeed not satisfied by Paris, France, or Europe, but is satisfied by Chicago, Germany, and Australia.

Instead, I propose we explain this by appealing to Maximize Presupposition, which, as we saw in 3.2, is independently motivated. Take Paris in (22). Paris is co-nested with s_c . So you could have used *here* to refer to Paris in this context. In that case you would have been presupposing that Paris is l_c . This presupposition is stronger than the one that is triggered by merely using *there* to refer to Paris, namely that Paris is a location. By analogy, presupposing that x is Barack Obama is stronger than presupposing that x is a person. So by choosing *there* the speaker must either be assuming, weirdly, that Paris is not co-nested with herself or she is violating Maximize Presupposition.

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References

- Beaver, D. 1997. Presupposition. In *Handbook of logic and language*, ed. J. van Benthem and A. ter Meulen. Elsevier.
- Beaver, D. 2001. *Presupposition and assertion in dynamic semantics*. Stanford, CA: CSLI Publications.
- Chemla, E. 2009. Presuppositions of quantified sentences: experimental data. *Natural Language Semantics* 17 (4): 299–340.
- Chemla, E. 2009b. Similarity: Towards a unified account of scalar implicatures, free choice permission and presupposition projection. MS.
- Cooper, R. 1983. *Quantification and syntactic theory*. Dordrecht: Reidel.
- Dennett, D. 1987. *The intentional stance*. Cambridge, MA: MIT Press.
- Evans, G. 1982. The varieties of reference (J. McDowell, Ed.). Oxford: Oxford University Press.
- von Stechow, A. 2003. Feature deletion under semantic binding. In *North eastern linguistic society*, vol. 33, ed. M. Kadowaki and S. Kawahara, 133–157. Amherst, MA: GSLA.
- Heim, I. 1991. Artikel und Definitheit. In *Semantik: Ein internationales Handbuch der zeitgenössischen Forschung*, ed. A. von Stechow, 487–535. Berlin: Walter de Gruyter.
- Heim, I. 2005. *Features of pronouns: The semantics of number, gender and person*, 2005. École Normale Supérieure, Paris, January: Handouts from lecture series.
- Heim, I. 2008. Features on bound pronouns. In *Phi-theory: Phi-features across modules and interfaces*, ed. D. Harbor, D. Adger, and S. Béjar, 35–57. Oxford and New York: Oxford University Press.
- Heim, I., and A. Kratzer. 1998. *Semantics in generative grammar*. Oxford: Blackwell.
- Huddleston, R., and G. Pullum. 2002. *The Cambridge grammar of the English language*. Cambridge and New York: Cambridge University Press.
- Hunter, J. 2013. Presuppositional indexicals. *Journal of Semantics* 30: 381–421.
- Kaplan, D. 1989. Afterthoughts. In *Themes from Kaplan*, ed. J. Almog, J. Perry, and H. Wettstein, 565–614. Oxford and New York: Oxford University Press.
- Kaplan, D. 1989. Demonstratives. In *Themes from Kaplan*, ed. J. Almog, J. Perry, and H. Wettstein, 481–563. Oxford and New York: Oxford University Press.
- King, J. C. 2018. Strong contextual felicity and felicitous underspecification. *Philosophy and Phenomenological Research*, 97.
- Kratzer, A. 1998. More structural analogies between pronouns and tenses. *Proceedings of SALT*, VIII, 92–110.
- Kratzer, A. 2009. Making a pronoun: Fake indexicals as windows into the properties of pronouns. *Linguistic Inquiry* 40 (2): 187–237.
- Nunberg, G. 1993. Indexicality and deixis. *Linguistics and Philosophy* 16: 1–43.
- Partee, B. 1989. Binding implicit variables in quantified contexts. In *Compositionality in formal semantics: selected papers by Barbara H. Partee* (pp. 259–281). Oxford: Blackwell.
- Percus, O. 2006. Antipresuppositions. In A. Ueyama (Ed.), *Theoretical and empirical studies of reference and anaphora: Towards the establishment of generative grammar as an empirical science* (pp. 52–73).

-
- Report of the Grant-in-Aid for Scientific Research (B), Japan Society for the Promotion of Science. (Citations from version available at <https://semanticsarchive.net>).
- Sauerland, U. 2004. *A comprehensive semantics for agreement*. Zentrum für allgemeine Sprachwissenschaft: Berlin, MS.
- Sauerland, U. 2008. Implicated presuppositions. In *Language, context and recognition: The discourse potential of under specified structures*, ed. A. Steube, 581–600. Berlin and New York: Walter de Gruyter & Co.
- Sauerland, U. 2008. On the semantic markedness of phi features. In *Phi-theory: Phi-features across modules and interfaces*, ed. D. Harbour, D. Adger, and S. Bèjar, 57–83. Oxford and New York: Oxford University Press.
- Schlenker, P. 2008. Be articulate! A pragmatic theory of presupposition projection. *Theoretical Linguistics* 34: 157–212.
- Schlenker, P. 2008. Presupposition projection: Explanatory strategies. *Theoretical Linguistics* 34: 287–316.
- Schlenker, P. 2012. ‘Maximize presupposition’ and Gricean reasoning. *Natural Language Semantics* 20: 391–429.
- Stokke, A. 2010. Indexicality and presupposition: Explorations beyond truth-conditional information. PhD dissertation, University of St Andrews.
- Stokke, A. 2022. Features of referential pronouns and indexical presuppositions. *Inquiry* 65 (8): 1083–111.
- Sudo, Y. 2012. On the semantics of phi features of pronouns. PhD dissertation, Massachusetts Institute of Technology.
- Yanovich, I. 2010. On the nature and formal analysis of indexical presuppositions. In *New frontiers in artificial intelligence*, ed. K. Nakakoji, Y. Murakami, and E. McCready, 272–291. Berlin: Springer Verlag.

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