THEORIA

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Fodor and demonstratives in LOT[&]

(Fodor y los demostrativos en el lenguaje del pensamiento)

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ABSTRACT: In this paper, we consider a range of puzzles for demonstratives in the language of thought we had raised in our last philosophical conversation we had with Jerry Fodor. We argue against the Kaplan-inspired indexing solution Fodor proposed to us, but offer a Fodor-friendly account of the demonstratives in the language of thought in its stead, building on our account of demonstrative pronouns in English.

KEYWORDS: attention, demonstratives, language of thought, Fodor.

RESUMEN: *En este artículo consideramos una variedad de puzzles sobre los demostrativos en el lenguaje del pensamiento que le planteamos a Jerry Fodor en la última conversación filosófica que mantuvimos con él. Criticamos la solución kaplaniana en términos de índices que nos propuso Fodor, y en su lugar ofrecemos una explicación de los demostrativos en el lenguaje del pensamiento que es amigable con Fodor, la cual se basa en nuestra explicación de los pronombres demostrativos en el inglés.*

PALABRAS CLAVE: atención, demostrativos, lenguaje del pensamiento, Fodor.

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Introduction

The last philosophical conversation we had with Jerry Fodor was on the topic of demonstratives in the language of thought (LOT).[1] We had raised for him the specter of Frege-style puzzles with demonstratives as stymying his account of mental content, but he convinced himself that a liberal use of indexing would solve these puzzles. *Prima facie*, his suggestion seems wrong in all the same ways an analogous position about demonstratives in natural language was wrong (as articulated in Kaplan (1989b), and discussed in his (1989a)). In what follows, we will review Kaplan's efforts to solve Frege puzzles for natural language demonstratives, and Fodor's strategy to try to extend these efforts to LOT. Along the way, we will articulate problems with both. And lastly, we'll sketch a positive proposal (extending our account of the semantics of demonstratives in English, developed in Stojnić et al (2013, 2017)) and then show how it can be exploited to solve the Frege-style puzzles we presented Fodor for mental content. We want to note at the outset that there is a significant literature on the topic and a number of authors have weighed in with their own criticisms and their own solutions of Frege puzzles for demonstratives in natural language and LOT, but we have neither the space nor is this memorial volume the proper venue for such explorations or disputes. So, we state up front that our goals are modest; namely, to focus on Fodor's suggestion made to us in passing and to offer in its place a solution we deem Fodor friendly. We begin with the problem.

The Problem

Imagine we are in a port, where a large ship, Enterprise, partially occluded by a block of buildings, is passing by. One interlocutor, ignorant of the situation, points to the bow on one side of the block, and then to the stern, on the other, while saying:

1. I doubt that (pointing to the bow of the Enterprise) is identical to that (pointing to its stern).[2]

According to the standard semantic account of the demonstrative "that" (Kaplan 1989b), the content of its occurrence is identical to the object demonstrated by the speaker.[3] Accordingly, the first occurrence of a demonstrative in (1) picks out whatever is demonstrated by the first demonstrative act concomitant with its use, and the second by whatever is demonstrated by the second act concomitant with its use. Since the speaker fails to notice there is only one ship, Enterprise, the embedded, complement clause in (1) simply expresses a proposition of self-identity. But no one could doubt the ship is self-identical! This is just a variation on Frege puzzles extended to demonstratives.[4]

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[1] See Fodor (1975, 2008) for the discussion of the LOT hypothesis.

[2] This example is famously due to Perry (1977).

[3] Whether it is a demonstration, or another parameter, e.g., the speaker's referential intention, which fixes the content of a demonstrative, does not matter for present purposes. See, e.g., Kaplan's (1989b) for an account that places the meaning fixing role on speaker intentions, rather than demonstrations.

[4] See Frege (1892/1980) for the original version of the puzzle.

The Fregean solution of attributing distinct senses to co-referring expressions, however, cannot get off the ground here, since, as seems reasonable, the demonstrative "that" has a unique sense, and so, its two occurrences in (1) share the same sense *and* reference. Thus, from the standpoint of Frege, they are synonymous. But (1) is obviously making a claim which can be quite informative.[5]

Kaplan acknowledged the problem and offered a non-Fregean solution to the demonstrative version of the Frege's puzzle by appealing to separate aspects of meaning: *character* and *content*. The character of an expression specifies its linguistic, standing meaning, say, for the demonstrative "that" that its referent, for any use, *is the inanimate object the speaker is demonstrating*.[6] Formally, it is specified as a function from *contexts*— comprising parameters of the utterance situation on which the interpretation depends, e.g., the world of utterance, the speaker, the time of utterance, the location of utterance[7]—to *contents*—the semantic content of an expression on an occasion of use. Contents, so construed, can be seen as a function from a circumstance of evaluation (comprising at least a world, and possibly a time, location and other parameters (Kaplan, 1989b)) to extensions.[8]

The character of certain expressions is a constant function, marking them as not varying in interpretation with changes in a circumstance of use. A name like "David Kaplan" picks out David Kaplan on every occasion of use, regardless of context. However, the interpretation of some expressions, like the first person pronoun "I", varies with context of use, and so, their character is not constant: it's a function from context to possibly different entities: if you say (2), the proposition you express will be that you are hungry, but if another says it, the proposition expressed will be that this other speaker is hungry:

2. I am hungry.

Similar considerations apply to "that", though there seems to be a difference: "that" is a *true demonstrative*, and "I" a *pure indexical*, in the jargon of Kaplan.[9] This means that the standing meaning of "I", but not of "that", fully determines a referent on an occasion of use: "I" simply picks out whoever utters it. "That"'s standing meaning requires extra-linguistic supplementation: an intention or a demonstration.

A distinction between the character and content of demonstrative expressions is relevant to Frege puzzle in that, given this distinction, the latter is essentially exhausted by

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[5] Obviously, such a Fregean account would struggle to explain the apparent direct referentiality of demonstrative thought. This primary point of disagreement separated Kaplan from Frege.

[6] This can be complicated in all sorts of ways to capture that demonstratives track distal/proximal distinctions ("this" vs "that"), or that they can be sensitive to intentions rather than demonstrations, etc. But these complications are orthogonal to our main point, and so we will ignore them.

[7] It makes no difference to our main points whether all of these parameters are indeed contextual (as Kaplan 1989b), or whether context includes further contextual parameters that might be needed (e.g., standards of precision for gradable adjectives, etc.). As Kaplan puts it, a "context is a package of whatever parameters are needed to determine the referent, and thus the content, of the directly referential expressions of the language" (Kaplan 1989b).

[8] Things are more complicated if contents are structured, but this also is orthogonal to our main issue.

[9] See Kaplan (1989a,b) for a defense of this distinction, though see Stojnić (2016, 2017, 2019a,2019b), Stojnić et al. (2017) for a criticism of it.

reference, while "cognitive significance" is relegated to the former.[10] So, unlike Frege, who builds cognitive significance into content, Kaplan relegates it to character. To illustrate how the strategy is supposed to help, consider a case from Perry (1979).[11] Suppose some-one has been tracking a trail of sugar left behind by a shopper in a supermarket. Upon see-ing herself in the mirror, not realizing it is she, she says, 'She is the messy shopper'. But when she comes to realize it is she who is making the mess, she says, 'I am the messy shop-per'. Even though the occurrences of 'she' and 'I' have the same referent, and thus, the same content, the two utterances differ in cognitive significance, on this proposal, because of the difference in characters of 'I' and 'she'—the standing meaning of the expressions—respec-tively. But how is the proposal supposed to extend to (1)?

Supposedly, the English word 'that' has a unique character; so, if character is supposed to be the bearer of cognitive significance, how then can we explain the potential informa-tiveness of (1)? It would seem Kaplan's proposal doesn't provide a way out of the puzzle surrounding cognitively significant utterances of (1). As noted, Frege, and those follow-ing his tradition, take such examples to establish a need for richer, more fine-grained con-tents that consist of senses (or modes of presentation). Since there is only one word "that" involved in this puzzle, this strategy would either require positing a single word with dis-tinct senses, or more likely, positing an ambiguity for "that". Others have taken such ex-amples to indicate, instead, the need to individuate *vehicles* of demonstrative speech more finely (Lepore and Ludwig 2000).[12] This account, too, would posit a kind of an ambiguity for "that". Kaplan himself exploits what is essentially a version of the later strategy, main-taining the character of a true demonstrative is only determined once coupled with a dem-onstration; when coupled with different demonstrations, different characters, and so, cog-nitive significances are determined.[13] One way this can be represented in logical form is by associating different indices with distinct occurrences of the demonstrative in logical form, one for each demonstration, and so, for each character. Whether a use of (1) is informative depends on whether the sentence used is (1a) or its homonymous (1b):

1a. I doubt that$_1$ ship (pointing to bow) is identical to that$_1$ one (pointing to stern).
1b. I doubt that$_1$ ship (pointing to bow) is identical to that$_2$ one (pointing to stern).

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[10] Functional presentation of Kaplan's semantics somewhat complicates the idea that content is ex-hausted by reference, but in ways inessential for our purposes. We stick to Kaplan's intended descrip-tion of his system. See Kaplan (1989b) for discussion.

[11] Whether it helps is controversial, but we will not address this issue here. (See, e.g., Perry, (1977, 1979); Evans (1981).)

[12] Most formal treatments of multiple demonstratives have resorted to subscripting the demonstratives in a formal representation. See, e.g., Burge (1974); Kaplan (1989b); Larson and Segal (1995); Lewis, (1972).

[13] Kaplan's (1989b) strategy posits an ambiguity in character: the character of "that" is determined only once it is coupled with a demonstration: so, distinct demonstrations result in distinct characters. Inso-far as the linguistic meaning of a demonstrative is incomplete, and requires extra-linguistic supplemen-tation (a demonstration), one might understand this as underspecification, rather than lexical ambigu-ity. However, the formal account is committed to a kind of ambiguity insofar as different occurrences of demonstratives receive different representations in the logical form. For a discussion see Kaplan (1989a), and Braun (1996).

In (1a) and (1b), both occurrences of a demonstrative pick out Enterprise, but (1b) can be informative, whereas (1a) not,[14] because the two demonstrative expressions in (1b) can differ in character. And so, (1b) is something a speaker can use consistently as something she can wonder and/or disbelieve, whereas (1a) cannot be so used. This is because, instead of having separate occurrences of the English demonstrative "that" uniformly represented in (1), according to this suggestion, we have occurrences of separate homonyms potentially with distinct characters, namely, "$that_1$" and "$that_2$".

Before evaluating this proposal, we turn to its extension by Fodor to LOT.

Demonstrative thought

Instead of demonstrative linguistic acts, Fodor's interest lies with *demonstrative thoughts*. Paradigms are thoughts typically expressed by sentences like "That is lovely," where, under normal conditions, the intended referent of 'that' is the most prominently present object; as we've seen, its different occurrences can express different thoughts. Now, whereas the sentence contains the demonstrative 'that', the corresponding demonstrative thought, presumably contains a *thought constituent*, 'THAT', which when mentally tokened, refers to some particular. What's distinctive about these demonstratives is that they arguably form the most direct link between mind and world. The connection with the world is direct, and non-mediated (i.e., demonstrative concepts, like demonstrative expressions, exhibit direct referentiality, in the sense of Kaplan (1989b)). Thus, suppose someone is looking at distinct objects, **a** and **b**, and thinks to herself the Mentalese counterpart of (3).

3.   *That* is distinct from *that*.

The referent of the first occurrence of the demonstrative is **a**, and the second is **b**. Regardless of this immediacy, demonstrative thoughts of the form 'THAT IS (IDENTICAL WITH) THAT', where the occurrences of the demonstrative refer to one object, can presumably sometimes, just as in natural language, be informative, and not a mere

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[14] There is a genuine question of whether an utterance of "That is that" can ever be used in a way that is essentially *un*informative. Kaplan points out the demonstrative "that" seems to require a new demonstration with each occurrence. If two occurrences of a demonstrative are governed by a single demonstration, at least one has to be anaphoric (contrast "That is that" with "That is itself"). The point seems to be that, even if the speaker is uttering the demonstrative while performing a single pointing gesture towards an object, English doesn't force occurrences of a demonstratives to co-refer. So, if they do, this is a mere accident. This would, in turn, suggest that each occurrence of a demonstrative (setting aside anaphora) requires a different index, corresponding to a demonstration, and hence, a different character. This yields what Kaplan calls "exotic ambiguity" in the use of a demonstrative (Kaplan, 1989b). We shall return to ambiguity below. For our purposes, though, it does not matter whether one can use "That is that" *un*informatively (i.e., whether one can express a form like (1a) with an utterance of that sentence). What matters is that one *can* use it *informatively*, which is a puzzle in itself. Hence, the task is to explain how we can use it to express forms like (1b).

application of self-identity. So, suppose the subject is looking through two small holes on an opaque screen, each attached to a tube, focusing each eye separately, looking at a single red dot on a white surface. The subject, then, is having an experience of qualitatively identical images, each of a red dot on a white background. Given this information, for all the subject knows, she could be looking at one dot or two, depending on the angle of the tubes.[15] This subject could think to herself the Mentalese counterpart of (4):

4. I wonder whether that is that.

where the first occurrence of the demonstrative picks out the dot seen through the left eye, and the second seen through the right one. Even though there is a single dot the subject is experiencing, she is not wondering whether self-identity applies. (This is the same type of puzzle we saw earlier. We could alter the Enterprise case to be about mental content as well.)

Whatever else the moral is, as with natural language, our treatment of demonstrative thought must be more complicated than simply letting the object causally responsible for the occurrence of the demonstrative itself be a constituent of the thought. One possibility might be to try to invoke Kaplan's distinction between character and (semantic) content again, letting content be exhausted by reference, while relegating "cognitive significance" to character. This strategy would seem to help with certain cases of indexical thought.[16] When the messy shopper comes to realize it is she who was making the mess, she will think to herself the conceptual counter-part of 'I am the messy shopper'. And even though the mental counterparts of 'she' and 'I' have the same referent, and thus, the same content, the two thoughts differ in cognitive significance, due to the different characters of the mental counterparts of 'I' and 'she' respectively. But, just as with Kaplan, in our demonstrative cases this proposal is also not obviously helpful, for, supposedly, the mental counterpart of 'that' should have a unique character; thus, if character is the bearer of cognitive significance, we cannot explain why 'THAT IS THAT' can be informative. Perhaps, this explains why Fodor told us he wanted to resort to indexing. With indexing, we cannot assume it is the same *vehicle of thought* flanking the identity; for distinct indices, m and n, 'THAT$_n$' and 'THAT$_m$' are naturally understood as tokens of different concepts or mental symbols, rather than that of a single concept. It is this distinction in indexing—an employment of a different vehicle, or a symbol with a different character—that explains the difference in cognitive significance. And so, we cannot assume that the expressions flanking the identity have the same character, and same cognitive significance.

So, in the Two Tubes case and the Enterprise example, the thought 'THAT$_1$ IS THAT$_2$' can be informative, since even though both occurrences of a demonstrative pick out the red dot or the Enterprise, *how* what is thought differs from *how* what would be thought by, say, the thought 'THAT$_1$ IS THAT$_1$', where both tokens of a demonstrative

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[15] The example is a variant of Austin's "Two Tubes Puzzle" (1990), which is a variant of a Frege puzzle, involving demonstratives.

[16] See Perry (1979), in particular.

in LOT also pick out the Enterprise, or the red dot.[17] Instead of two separate tokens of a single mental symbol in (4), namely, the demonstrative 'THAT', we have two distinct symbols tokened, namely, '$THAT_1$' and '$THAT_2$'.[18]

Problems with indexing[19]

One worry this strategy faces for language and thought, already foreshadowed earlier in the text, is that "that" and "THAT" seem like an unambiguous word and a single concept respectively, and not distinct homonymous words and concepts. But representing different tokens of a demonstrative with different indices treats "that" and 'THAT' as ambiguous. Start with the demonstrative "that". If its character is its standing meaning, then if each indexed demonstrative is associated with a different character, "that" is indefinitely ambiguous—one meaning for each index. Likewise, we'd have to posit indefinitely many concepts '$THAT_n$', one for each index.

This strikes us as implausible. First, English seems to have one word, "that", not indefinitely many accidental homonyms. It's hard to imagine a competent speaker who understands the meaning of one instance of "that", but fails to understand another. (By contrast, a competent speaker can know one meaning of "bank", but not another.) Similar considerations ought to hold for the concept 'THAT'.

Furthermore, if "that" is ambiguous between differently indexed expressions, what determines the distribution of indices for any given tokening? To see what's at stake, consider an utterance of (5):

5.   That it distinct from that.

Is its disambiguation "$That_1$ is distinct from $that_2$" or "$That_1$ is distinct from $that_1$"? The answer cannot simply depend on whether the demonstratives are co-referential—this would rule out (1), where the speaker is wondering whether something which, in fact, is a single ship, is a single ship.[20] Perhaps, we could say that, for any n, the character of the de-

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[17]   Again, we shall not worry about whether such thoughts *can* be *un*informative, only about how they could be informative. As explained above, this in itself is a puzzle.

[18]   As before, this suggests an ambiguity: '$THAT_1$' and '$THAT_2$' are naturally understood as tokens of different concepts or mental symbols, rather than that of a single concept; after all, recall, it is the distinction in indexing—an employment of a different vehicle, or a symbol with a different character—that explains the difference in cognitive significance. One could, we suppose, as with linguistic expressions, subscribe to underspecification, according to which '$THAT_1$' and '$THAT_2$' are tokens of the one and the same, albeit underspecified, concept 'THAT', which has full character—or corresponds to a complete vehicle—only once coupled with an index. Whether or not such an underspecification account is viable at the level of concepts, our main worries will apply equally to such an account as well.

[19]   As mentioned earlier, Braun (1996) contains an interesting discussion of difficulties this approach raises in Kaplan's framework for providing a semantics for (English) demonstratives.

[20]   Bear in mind one could in principle (finiteness limitations aside) have sentences with indefinitely many occurrences of a demonstrative expression. (E.g., "That is that, which is that, which is that,...".)

monstrative 'that$_n$', or with a demonstrative concept, 'THAT$_n$', picks out the nth object demonstrated on an occasion of use or mental tokening respectively. On this scenario, in a given context, a use of 'that$_n$' is acceptable only if the speaker intends to pick out the nth object demonstrated in that context (if any), and similarly for her tokening of a demonstrative concept, 'THAT$_n$'. This suggestion is not without problems: for one, it is not clear that one can have repeated occurrences of a single demonstrative, say 'that$_n$', in a single context.[21] Due to reasons mentioned earlier, it is not obvious a single demonstration, or demonstrative intention, can be associated with different tokenings of a demonstrative. (Recall, Kaplan (1989b) points out that, at least in English, when two demonstratives are linked to a single demonstration, or demonstrative intention, at least one seems anaphoric, as exemplified by the contrast between "That [pointing at a vase] will break, if that [pointing at a vase] falls" with "That will break if it falls." It is not unnatural to think the same applies to the corresponding thoughts.) If so, this means *each* new tokening corresponds to a new expression.[22]

But there is a larger, though related, problem with indexing; it seems to saddle us with indefinitely many words and concepts—as many as there are n-s.[23] This in itself is not yet a problem, since it is uncontroversial that there are infinitely many words (and concepts) a finite mind can grasp, where this is standardly explained on the assumption of compositionality (Fodor and Lepore 2002). But we need to settle that these purported ambiguities do not require infinitely many *primitive* concepts.[24] So, can we invoke compositionality to account for the meaning of each indexed expression? *Prima facie*, it might seem we cannot, since the semantic value of "that1" (or "THAT$_1$") doesn't seem to be a function of the values of "that" (or "THAT") and "$_1$" (or "1"), in any natural sense relevant for the productivity of thought.[25] We can, of course, specify a function that would obey compositionality: we could take the character of "that" to be a function from contexts to functions from indices to objects. Then, given a context C_1, "that$_n$" is interpreted as a function that takes the index n and delivers the nth demonstrated entity in C_1,

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[21] See Kaplan (1989b) for a discussion of this worry. See also Braun (1996).

[22] Note, further, it is unclear how to individuate contexts relevant for thoughts. If a context spans only a single sentence, inference will be difficult to capture (e.g., in principle, we might want valid instances of "That is round and red. Therefore, that is red"). But if a context can span an arbitrary number of sentences, it becomes difficult to tell, in a non-arbitrary way, when a new context begins and a previous one ends. On the present picture, it is the individuation of contexts that crucially factors into the individuation of expressions (e.g., whether we have a tokening of "THAT$_n$", sensitive to the nth demonstration of an old context, or the 1st demonstration of a new one). It is even less clear agents have a non-arbitrary way tracking such distinctions, let alone play the role of cognitive significance.

[23] Though, see Levine (2010) for possible constraints on the number of indices.

[24] We follow Davidson (2001/1966, 8-9) in saying an expression is a semantic primitive relative to a set of interpretable items iff its meaning is unpredictable from the meanings of members of the set.

[25] Note that even on a Kaplanean story, the numerical index is supposed to contribute a mode of presentation associated with a demonstration (or intention), and not a linguistically specified meaning of the index.

if any.[26] This essentially means "that" maps a given context to an assignment function: a (partial) mapping of indices to objects. In this case, "that$_n$" is complex, and its context-sensitivity is inherited from the different assignment functions denoted by "that" in different contexts (we can assume that the numeral is a constant, delivering n for "n" in any context). Alternatively, we could treat "that$_n$", not compositionally, but via a background semantic rule that specifies the meanings of all primitives at once: for any n in N and context c, "that$_n$" denotes the nth object demonstrated in c; otherwise, it is undefined. This would essentially interpret demonstratives as variables, along the lines of Kaplan's (1989a, b) proposal.

Perhaps, such accounts can explain how to generate indefinitely many demonstrative expressions in a compositional fashion. They still, however, posit rampant ambiguity where there is seemingly *none*: at the level of logical form, or meaning representation, a seemingly unambiguous expression is represented in potentially indefinitely many distinct ways. More precisely, on the first account, the one invoking semantic composition, while the demonstrative itself makes an unambiguous contribution, it is incomplete, and requires composition with an index; but one and the same string "That is lovely" or "THAT IS LOVELY" can feature indefinitely many distinct indices, and so, the form is still indefinitely ambiguous.[27] On the second account, meanwhile, different occurrences of a demonstrative are represented by different subscripted expressions, again allowing for a seemingly unambiguous "That is lovely" or "THAT IS LOVELY" to be indefinitely ambiguous.

Further, both accounts fail to explain why, when we point to the bow and stern, wondering "Is that the same as that?", the representation *is* "Is that$_1$ the same as that$_2$?," rather than any other potential disambiguation, and further, how this affects the cognitive significance so that such thoughts are not merely questioning the law of self-identity. While we don't want to argue these considerations should be taken as decisive, knock-down arguments against any kind of indexing strategy, they do make us pessimistic regarding a satisfactory and explanatory implementation of an indexing account. At any rate, without attempting to settle the debate over its ultimately viability here (in particular, without further exploring the question regarding the possibility of a productive, yet unambiguous, account of demonstrative meaning), we instead suggest an account that avoids ambiguity, assigns a single, uniform meaning, and does so in a way we think Fodor would have found to be a friendly emendation.

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[26] That is, we interpret "that" roughly as $\lambda c.\lambda n.f(n)$, where $f(n) = c_n$ where c_n is the nth object demonstrated in context c; or else, $f(n) = \#$, where $\#$ is the undefined value. Presumably, this is the content of "that" in c, which combined with a numeral n delivers the content of "that$_n$", the nth object demonstrated, if any, or else $\#$. Notice that this suggests "that$_n$" doesn't have an interesting character, and in any case, not a context-sensitive one (it has different contents in different contexts, but all context-sensitivity is inherited from "that").

[27] It is worth reemphasizing that there is a further open question of what aspect of the token utterance or thought contributes the index, and how that determines its cognitive significance, in a way that distinguishes the cognitive significance of 'that$_m$' and 'that$_n$' ('THAT$_m$' and 'THAT$_n$'), for distinct m, n.

Back to *Demonstrative Thought*

Our suggestion, in short, is that an occurrence of a demonstrative 'THAT' in LOT refers to whichever object is currently at the center of attention (in a sense to be explained presently).[28, 29] So, if we observe objects **a** and **b**, and think to ourselves (6):

6.   THAT IS DISTINCT FROM THAT.

Then, these two occurrences of the same perceptual demonstrative 'THAT' can refer to **a** and **b** respectively only if there is a change in *focal attention* between the two; namely, the first occurrence goes in tandem with promoting **a** to the center of focal attention, and then, the second follows a shift in attention which promotes **b** to the center of focal attention. This is our proposal in a nutshell. Before we can spell out its details, and explain how it tackles the Two Tubes case, we first survey some empirical data on perceptual attention.[30]

Early Vision, Perceptual Attention and Object Tracking

There are good reasons to think early stages of visual processing begin with some kind of mechanism of pre-conceptual object selection—a mechanism of non-conceptual reference—that links mind and world through a causal, as opposed to informational or seman-

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[28]   Stojnić et al. (2017, 2013) provides an analogous account of demonstratives in English. However, the notion of the *center of attention* relevant for the interpretation of a demonstrative in English defended there is not determined by a psychological notion of attention, but a linguistic one, where what's at the center of attention, in the relevant sense, in a discourse is determined through a set of conventionalized linguistic rules. Since here we are only interested in thought, and specifically in perceptual demonstrative thought, we will focus on perceptual attention. How this notion of attention relates to the linguistic notion of attention we discuss in prior work, and whether there is an analogue of linguistic attention that determines the interpretation of demonstratives at the level of thought in mental counterparts of discourses (such as "John came in. He sat down", where the demonstrative pronoun is resolved to the individual made prominent by the prior discourse) is a complex issue we cannot address here. We note that we should allow for the possibility that a given use of a linguistic demonstrative can fail to pick out an object the speaker is simultaneously successfully picking out with a token of a mental demonstrative. Even if Fido is the center of one's visual attention and is successfully picked out with a token 'HE' in mental representation 'HE SAT DOWN,' if the thinker says "John came in. He sat down", this use of the linguistic expression "he" will pick out John, regardless. It is also worth pointing out that, though we focus on perceptual demonstratives and so perceptual attention, we see no in principle obstacles to extending our account to demonstrative thought involving other perceptual modalities, or non-perceptual cases (e.g., using 'THAT' to select something accessible through memory). We suggest the extension would exploit analogue of visual attention in these modalities, but we refrain from attempts to extend our account to such cases in the present paper.

[29]   One might object, Why think there is a current center of attention? Aren't we typically attending to more than one thing? But on this account, mustn't we posit reference failure whenever we attend to more than one thing? Our account will indeed have to be made consistent with the possibility of multi-focal attention. We will gesture towards a solution that respects this below.

[30]   A related account to ours is Levine (2010), who likewise focuses on the role of attention. However, there are important differences between the two, which will be relevant for giving a unique unambiguous representation of a demonstrative on each of its occurrences. We will elaborate below.

tic, relation (Pylyshyn, 2009, 1989; Pylyshyn and Storm, 1988). We briefly mention some evidence for this hypothesis.

Consider the Multiple Object Tracking (MOT) Experiment, as described by Pylyshyn and Storm (1988). In the basic experiment (represented in Figure 1, borrowed from Scholl (2009)), subjects are shown 8 to 12 identical objects on a display. Some are then briefly made salient, and indicated as targets (e.g. by blinking, as demonstrated in Figure 1(a)). All the objects then start moving unpredictably around the display (Figure 1(b)). After approximately 10 seconds the motion stops, and the subject must identify the initial targets (by highlighting them with a cursor, as in Figure 1(c)).
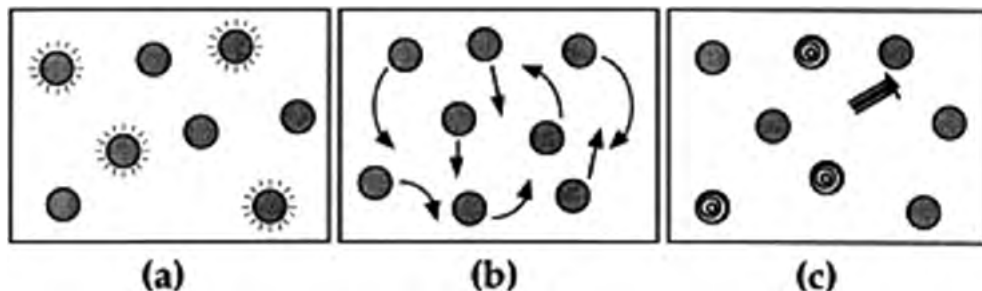

Figure 1

Experiments show humans can track up to five targets within the display with 10 identical independently moving objects; once this number is exceeded, performance significantly deteriorates. Importantly, as Pylyshyn argued at length (2009, 1999, 1989) the experiments suggest that the early vision system must be able to individuate and keep track of these visual objects without using an encoding of any of their visual properties. Note that if this tracking were appealing to some descriptive information, it would have to be sustainable under a description of the objects' location at a time *alone*, since they are otherwise identical. But, since the objects are in constant unpredictable motion, their locations are constantly changing; to track them by keeping track of, and updating, their respective locations, one would have to have a way of storing and updating their respective locations. As Pylyshyn (2009; 1989) and Pylyshyn and Storm (1988) argue, it is implausible that this strategy is employed, since, even under liberal assumptions about the speed of attentional shifts that would have to be involved, we would not be able to account for the observed performance (subjects perform with over 85% accuracy, and the proposed model would predict the best performance would be around 30%). This suggests that tracking is achieved *without* recourse to descriptive or conceptual information of the targets.[31]

Pylyshyn's conclusion is further supported by the fact that performance does not drop off with an increase in the number of targets up to 5, but does significantly with more than 5 targets. Pre-conceptual processing typically shows this kind of a pattern of uniform per-

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[31] It's striking that subjects can successfully track targets even when all their qualitative properties have been changed, or when the moving target disappears and reappears as if going behind an occluding surface (but not if the motion is discontinuous). (See Pylyshyn 2009.)

formance up to the limits of the system's capacities, followed by a sudden drop-off; conceptual processes, by contrast, exhibit a gradual decrease in performance with a corresponding increase in complexity and the number of tasks (e.g., tracking a single target, as opposed to tracking two, three, etc.).[32]

To explain this sort of tracking without recourse to properties of the targets tracked, Pylyshyn (1989; 2003; 2009) suggests the visual system contains a mechanism of *non-conceptual* 'visual indexing', which enables the system to reference and track multiple distinct targets through time. The human early visual system is equipped with (up to five simultaneously active) visual indices (FINSTs) that are activated, or 'grabbed' by salient targets in the environment (e.g., targets rendered salient by 'flashing' in MOT).[33],[34] FINSTs provide symbols connected to the world through a causal, not semantic, mechanism. Only after targets have grabbed FINSTs can the system cognitively access them, and direct focal or selective attention towards them.

Pylyshyn (2009) cites an abundance of evidence that the primary unit of selection by FINSTs (or a unit of 'FINSTing') is objecthood, as opposed to regions of space. This means that what gets selected by FINSTs is roughly co-extensional with physical objects in our world; crucially, however, the correlation need not be perfect, precisely because FINSTing is not achieved through an application of a conceptual category (say, 'OBJECTHOOD'), but rather through a purely causal relation. Consequently, although what's selected by FINSTs tends to correspond to physical objects in our kind of world, FINSTs do not select these objects *qua* physical objects, and can thus sometimes fail to grab individual objects. One way to think about it is this: suppose we think of conceptual information associated with an object as contained in an object file associated with that object (cf. Kahneman et al, 1992). Then, one can think of FINSTs as mechanisms through which an object file is associated with the object it is about to begin with, if any (where crucially that association does not appeal to any conceptual information contained in the object file—not even that it falls under the concept 'OBJECTHOOD').[35]

If these findings are on the right track, the first stage in vision begins with a non-conceptual connection between mind and world—the FINST mechanism. Only once such a non-conceptual connection is established does the cognitive system gain access to

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[32] The literature on the subject is vast, and our survey is cursory. However, many studies seem to corroborate these conclusions. See Scholl et al. (2001), Sears and Pylyshyn (2000), and Pylyshyn (2009) for discussion and a more comprehensive list of references. See Scholl (2009) for a critical discussion.

[33] An anonymous referee points out that it might be confusing to talk about "targets" (which evoke something passive) doing the "grabbing" (which evokes an action), so we take a moment to clarify that the "targets" are targets in the context of the task: they are made into targets for the purposes of the task by 'flashing' which renders them salient; as a consequence of this 'flashing' the FINSTs are "grabbed" or activated.

[34] Pylyshyn (2009) argues the targets that activate FINSTs tend to correspond to physical objects in our world. However, since this mechanism is non-conceptual, the targets are not selected qua physical objects, and can, thus, at times fail to correspond to real physical objects. Pylyshyn thus calls them 'visual objects'. We return to this point below.

[35] For this characterization, and further critical discussion, see in particular Pylyshyn (2009).

FINSTed objects, and can direct focal attention to them.[36] But how does this help establish the referents of perceptual demonstratives?

Attention and Perceptual Demonstratives

In our earlier sketch, we proposed that the referent of a demonstrative expression is that object (if any) currently at the center of attention. If the model sketched in the last section is on the right track, the most primitive mind-world connection is established through a pre-conceptual mechanism of FINSTing, whereby targets that grab FINSTs become accessible to higher cognitive processes, and become potential targets of focal, or selective, attention. For a candidate object **a** to be the referent of a perceptual demonstrative, **a** must first become a target that activates, i.e. g, grabs, one of the FINSTs *and* second, selective, focal attention has to be directed to this FINSTed target. Why do we need both requirements?

The first should be easy to understand. The FINSTing mechanism, on this model, provides the most primitive, non-conceptual form of mind-world connection that allows for concept application—or, put another way, it is the mechanism through which an object file is connected with the object it is about (if any). If a system has no access to the object, that object cannot be a part of the content of conceptual thought; since this access is achieved (at least for visual objects within the perceptual circle) through a mechanism of non- (or better, pre-) conceptual contact, a pre-conceptual connection is needed for concept application.

The second requirement is more complicated. Why do we need selective, focal attention in addition to a primitive non-conceptual connection to fix the referent of a demonstrative? Why isn't a non-conceptual connection sufficient? In its favor, there would be nothing more to applying a perceptual demonstrative than FINSTing the object. But this suggestion isn't going to fly because FINSTs are pre-conceptual (non-conceptual), whereas thought involving a perceptual demonstrative *is* conceptualized, involving the application of a perceptual demonstrative concept, say, 'THAT'. Although the demonstrative 'THAT' may have limited or impoverished descriptive content, still thoughts involving this concept are nonetheless fully conceptualized. To see this, focus on other (perceptual) demonstratives (e.g. 'HE', 'SHE', etc.), which manifest the same dependence upon a (perceptually available) situation as the demonstrative 'THAT', and seem to function in analogous ways, yet carry a richer descriptive content (associated with gender, number and person constraints). Clearly, thinking of an object under the concept 'HE' makes use of properties associated with that object, in sharp contrast with the passive mechanism of FINSTing.

On the other hand, even after distinguishing perceptual demonstratives from non-conceptual mental symbols (FINSTs), we might still think a causal, non-conceptual connection achieved through FINSTing suffices to establish the referent of a perceptual demonstrative. But, then, why not just say the referent of a demonstrative is that object that occupies an appropriate position in the causal chain resulting in tokening the demonstrative? The problem here is the same one we began with: recall the Two Tubes case—where

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[36] For further discussion of the relation between FINSTs, perception, attention, and reference, see also Fodor and Pylyshyn (2015).

the referents of both tokens of a demonstrative (by stipulation) are one and the same; if we assume the demonstrative has a uniform representation on each tokening (i.e. that there is a unique, unambiguous demonstrative expression the tokens of which are featured in the relevant representation), then we are back to square one with respect to the problem with which we began. The relevant thought content is that **a** is identical to **a**, where **a** has been referenced via the same vehicle of thought twice. Yet the thought is non-trivial and informative.

To avoid this result, we need a more complex structure, and one is available. We have said before there is good reason to think FINSTs target what in our world corresponds to objects. What happens in the Two Tubes case, or the Enterprise example, however, is that one and the same object grabs, or activates, distinct FINST indices, thus, leading to establishing distinct object files; distinct non-conceptual mental symbols are associated through FINSTing with one and the same object (the red dot, or the Enterprise). In other words, the system treats one object as if it were two.

How does this help with puzzles surrounding the referents of demonstratives? In our problematic case, we have two (non-conceptual) mental symbols (causally, non-conceptually) targeting a single *physical* object. We can make use of these mental symbols in accounting for problematic cases of the referents of demonstratives like the Two Tubes example. What accounts for the cognitive significance of a thought involving perceptual demonstratives is that the referent at one end of the causal chain results in the relevant tokening of a perceptual demonstrative, together with the non-conceptual mental symbol—or the FINST index—via which this reference is established. Now, since at any time, the system can have multiple active indices (and in our example, multiple indices connected to one and the same object), what makes one rather than another the index through which the reference of a token of a demonstrative is established? This returns us to our second requirement. The answer is that the index through which reference is fixed is the one which guides the allocation of selective, focal attention at the occasion of tokening. The idea is that selective, focal attention plays the role of mental demonstration, which fixes the reference of the tokened perceptual demonstrative (concept). It focuses on the target, and the demonstrative references whatever is at the center of attention at the time of tokening.

Suppose the expression '@( )' represents an operator that updates the center of focal attention, where @( ) directs focal attention to the item indexed by the index it operates on, and 'f1'...'fn', as designating the FINST indices 1 to n, respectively. '@( )' is thus a mental counterpart of a pointing gesture—a way of shifting, or re-focusing attention.[37] Then, where 'THAT' is a perceptual demonstrative concept (itself directly referential), the repre-

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[37] For an account of pointing gestures as linguistic mechanisms providing attention-shifting updates, see Stojnić et al (2017), and the formal implementation therein. As mentioned before, the account in Stojnić et al (2017) is designed to model a linguistic notion of center of attention *in discourse*, which is maintained through a set of linguistic mechanisms (pointing gestures including). On that account, something can be *at the center of attention,* in that sense, even if it is not psychologically most salient, or a focus of (joint) attention of the conversational agents (e.g., even if Betty, the cat is perceptually most salient and the focus of the conversational agents' perceptual attention, if someone says "Mary came in. She sat down," the referent of 'she' will be Mary nevertheless, because this referent is at the center of (linguistic) attention.

sentation for the potentially informative thought in the Two Tubes example is (7) below, which differs from the uninformative and trivial (8)-(9):

7. $@(f_1)$ THAT is $@(f_2)$ THAT.
8. $@(f_1)$ THAT is THAT.
9. $@(f_2)$ THAT is THAT.

In (7), the center of selective, focal attention shifts between two tokenings of a demonstrative from one index to another. So, the two demonstratives are not guaranteed to co-refer. On the other hand, in (8) and (9), the attentional focus remains unchanged, and hence, different tokens of a demonstrative are forced to co-refer.[38] The reference of a perceptual demonstrative is whatever is at the center of the selective, focal attention (if any unique thing is) at the time of the tokening. In (7)—(9), the subject is referring, by hypothesis, to a single *physical* object; however, it can still be informative that the object the subject is attending to as one visual object, and a target of one visual index, is the same object as the one the subject is attending to as a distinct visual object, targeted by a distinct index. This is what it means to have an object be a target of two distinct FINST indices—the system treats the object as two distinct visual objects. This explains why (7), but not (8) or (9), can be informative.

We account for the thought in (3), where the occurrences of its demonstratives respectively refer to distinct objects—**a** and **b**—in a similar fashion. Suppose f1 and f2 are activated by **a** and **b** respectively. We capture the thought in (3) as (10):

10. $@(f_1)$ THAT is $@(f_2)$ THAT.

Both occurrences of the demonstrative refer to what's currently at the center of (focal) attention. The reference of the first occurrence is established via the FINST index f1, which is a grabbed by **a**, and the reference of the second occurrence of the demonstrative is established via the FINST index f2, activated by **b**.[39]

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[38] Earlier, we questioned whether different tokenings of a demonstrative expression can be guided by the same demonstration or intention. On our account of demonstrative concepts, this question can be rephrased by whether one can have constancy of focal attention between different tokenings of a demonstrative *concept*. Insofar as one can, the corresponding, uninformative thought (as in (8) and (9)) can ensue. It is important to note that this is a separate question from whether each token of the demonstrative expression *in English* requires a new demonstration/intention. Either answer to the former question is compatible with the possibility that each token of a demonstrative expression "that" *in English* might require a distinct demonstration (so that we don't get the corresponding uninformative representations for tokens of the English sentence "That is that").

[39] One might worry that since our explanation relies on shift in focal attention to capture cognitive significance, that in terms of what is going the shift appears to be a brute fact, that cannot be explained at the personal level by the difference in FINSTs at the subpersonal level. But even though FINSTs are subpersonal pointers, they provide input to cognitive processing at the personal level—e.g., storing information about FINSTed objects in respective object files, or directing attention to relevant visual objects that facilitates such processing. The cognitive significance associated with attention shifting operators we posit in relevant mental representations that track distinctions at subpersonal level should not worry us more than the distinctions in conceptual content stored in respective object files that track connections to different FINSTs. We thank an anonymous reviewer for raising this issue.

We suggested that selective, focal attention could play the role of an accompanying (mental) demonstration, which in tandem with the demonstrative fixes the reference of a tokening of a perceptual demonstrative. But can attention suffice to supplement the meaning of a demonstrative in fixing reference? One reason to think not is discussed by Levine (2010). He develops an account which, like ours, maintains that the selection of a target and attention, via FINSTing, are both necessary for establishing reference. However, he claims we need another operation, namely, the operation of mental demonstration, to fix reference, over and above what is delivered by attention. His reasoning is that subjects can simultaneously attend to more than one thing. Since demonstratives require uniqueness, if it were solely the selection of the target and attention that mattered for reference fixing, we would get a reference failure whenever the subject is attending to more than one thing.

There is good evidence that one can indeed attend to more than one thing at a time; one may think the Multiple Object Tracking experiment described above provides evidence for precisely this possibility.[40] We, in no way, intend to deny this. We are merely suggesting that the process relevant for reference fixing a perceptual (singular) demonstrative requires selective,(uni-)focal attention, which can be targeted to each of the indexed targets, separately.[41] This is entirely consistent with thinking that systems like ours can (and typically) do attend to more than one target at a time. So, the possibility of multi-focal attention is in no way incompatible with the claim that focal attention plays a crucial role in establishing the reference of a demonstrative. It is sufficient that the subject can direct focal attention towards particular indexed targets, as seems to be so (Pylyshyn, 2009), for it to be possible to safeguard against reference failure due to a violation of uniqueness.[42] It can still be that selective, (uni-)focal attention is required for demonstrative thought, even if creatures like us can and do typically attend to more than one thing at a time. Since the relation of mental demonstration is posited to amend the alleged insufficiency of attention, it seems like no such relation need be posited.

At the same time, a more important distinction separates our view from Levine (2010). In postulating mental demonstrations, which serve as pointers to FINST, Levine seems to take them as mental demonstratives, or parts thereof. He writes: "The demonstrative constituents in thoughts can thus be thought of as simply pointers to previously selected objects" (Levine, 2010, 179). A demonstrative constituent of thought corresponds to mental demonstrations to corresponding percepts. So, according to him, the demonstrative is canonically represented as '$\rightarrow[\alpha]$', which is a directly referential singular term referring to the object represented by the percept designated by 'α'. But, this, from our standpoint, recreates the ambiguity we were trying to avoid: different tokens of a demonstrative concept need to be represented in non-uniform ways (corresponding to different percept-denoting symbols). On our account, by contrast, ambiguity is averted—the demonstrative concept always receives uniform, unambiguous interpretation. Ambiguity is averted because we separate, as seems to us correct to separate, the representation corresponding to a token of the

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[40] Multiple object tracking is sometimes referred to as 'tracking using multifocal attention'.

[41] Perhaps, multi-focal attention is relevant for reference fixing for plural demonstratives. We cannot pursue this topic here.

[42] And indeed, it seems to us plausible that in the split-attention case, without serial allocation of focal attention to distinct visual indices, one should expect reference failure for "THAT IS THAT," just as one would were one to say "That is a cute dog" looking at park full of dogs, none particularly salient.

demonstrative concept itself, from the attention-affecting operation that determines the reference of each token demonstrative.

Conclusion

We have sketched and partially defended an account of demonstratives in LOT that we believe captures our intuitions, while preserving direct referentiality and allowing for a uniform representation of the tokens of demonstrative concepts, thus, avoiding an unwelcome ambiguity. A demonstrative refers to whatever is at the center of selective, focal attention at the time of its tokening, where attention operates on non-conceptual representations—FINST indices. Thoughts with distinct co-referential occurrences of a demonstrative concept can be informative, so long as there is an appropriate shift in selective focal attention between them, which helps determine reference in tandem with each tokening of the demonstrative, by focussing on the relevant FINST indices in turn. This account is straightforward, and it is one, we'd like to think, Fodor would embrace.

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