Section 1

Alice believes her local baseball team has several Bobs on it. In fact, they only have one Bob. Maybe this happened because Alice met that same player repeatedly, and didn’t realize she was getting reacquainted with someone already familiar. Or maybe she only met him once, but through some cognitive glitch she mistakenly opened several “mental files” for that single player. Either way, let’s suppose she has now forgotten the specifics of how she met “each” Bob; and let’s suppose that the memories, information, and attitudes she associates with “each” of them is the same—or as close to this as possible. (We will discuss how close it is possible to get later.)

Presently, Alice is thinking how the voting for her team’s most valuable player will go. There’s a thought she can entertain that we might articulate, on her behalf, like this:

(1) Bob\(_i\) will vote for Bob\(_j\).

where \(i \neq j\).\(^1\)

One interesting question is whether, in the story I’ve given, Alice would also be in a position to entertain a distinct thought, that we should articulate like this:

(2) Bob\(_j\) will vote for Bob\(_i\).

The story I’ve told doesn’t put Alice in a position to have more justification for accepting one of these thoughts over the other; but that doesn’t settle

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1 So players on the team are allowed to vote; and they are allowed to vote for themselves. More precisely, I assume that will vote for is an extensional binary predicate that’s neither reflexive nor irreflexive.
whether there are two distinct thoughts available here for her to entertain. (If we think there aren’t, perhaps the way she’d have to express her single thought is One of the Bobs will vote for the other.) Whatever our views on that question, though, most will want to distinguish the thought we’ve articulated with (1) from a thought we’d articulate like this:

(3) Bob, will vote for Bob.

It’s only this last thought, we expect, whose acceptance would rationally commit Alice to the thought that anyone self-voted. Yet as I’ve described these cases, Alice was only ever thinking of a single player throughout. It’s just that in case (1)—but not case (3)—she’s unknowingly thinking of this single player twice, or via two different presentations.

Despite the familiarity of this contrast, there is some awkwardness finding a vocabulary perfectly suited to characterize it.

One phrase I just employed was “unknowingly thinking of a single player twice.” But how should we describe the contrasting case (3)? Shall we say that there Alice knowingly thinks of a single player twice? That over-intellectualizes what’s going on in case (3). Nothing I said required Alice to have any opinion about her own thoughts; and absent some controversial assumptions about the transparency or luminosity of introspection, it’s not obvious that if she did have opinions about her own thoughts, they’d have to be correct.

Another phrase I employed was “two different presentations.” That might be okay if we understand it to mean two numerically different presentations; but it’s too easily heard as implying that the presentations must differ in some qualitative, that is, not-merely numerical, way. And that further step should be a substantive one. Later I will argue that it should sometimes be resisted: Alice’s two presentations in case (1) needn’t differ except numerically. But even if I’m wrong, the fact that this can be intelligibly disputed speaks for choosing a vocabulary that doesn’t prejudge the question.

One recently popular way to characterize the difference between cases (1) and (3) is to say that in the latter but not the former, Alice thinks about Bob in a way that coordinates the two argument roles her thought ascribes to him.\(^2\) This can also be misconstrued, but it’s the vocabulary I will adopt.

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\(^2\)This phrase was popularized by Fine 2007; its use doesn’t presuppose commitment to the specific semantic proposals Fine defends in that work. One wrinkle is that Fine’s first uses of this phrase are to discuss theories where two variables have a range of values as their interpretation, and the semantics requires those ranges to be “coordinated”: that is, choosing one value from the range for one variable fixes what value the other variable takes. That picture won’t carry over to the semantics of names, which don’t have ranges of values. But Fine does also go on to talk of names being semantically “coordinated”, in a sense that roughly corresponds to the notion we’re focusing on here: sentences or thoughts like the ones in our case (3), as opposed to case (1). See his pp. 23–4, 29–31, 39–40.

Yet another phrase with some currency is “de jure” or “strict coreference,” versus “de facto” or “accidental coreference.” See for example Fine 2007, pp. 43ff; Pinillos 20xx; Evans 1980 §5; Fiengo and May 1994 Chapter 1–2. As the later readings in this list emphasize, this
Many are willing to count thoughts as sometimes distinct though their contents are “logically equivalent.” One form of this will say that here are distinct contents for thoughts to have:

$$(1') \ (\lambda x. x \text{ will vote for Bob}) \ Bob$$

$$(3') \ (\lambda x. x \text{ will vote for } x) \ Bob$$

If one’s willing to say this, then one might describe our case (1) as one where even if Alice thinks contents of form (1’), she doesn’t think contents of form (3’). In case (3), she does think contents of form (3’). That characterization doesn’t seem to commit you either way on the question whether Alice’s two thought-tokenings of Bob in (1) and (1’) have different contents. And so it might seem an attractively minimal way to capture the difference illustrated by our cases (1) and (3). (If you wanted to go on to distinguish case (1) from case (2), then you’d have to say things less minimal.)

It’s worth seeing why this attractive thought fails. When the (1)/(3) phenomenon appears in more complex cases, the strategy of attributing it to differences in the predicate, as (1’) and (3’) do, can’t always succeed. This is because the predicate structure is sometimes needed to do other independent work.

Consider the following two clusters of claims:  

(4a) Only Carol wrote on Carol’s ballot.
(4b) Carol, and no one else, wrote on the ballot given to Carol/her.
(4c) \((\lambda x. x \text{ wrote on Carol’s ballot}) \text{ Carol; and no one else } \_\_\_\_.\)

(5a) Only Carol wrote on her own ballot.
(5b) Carol, and no one else, wrote on the ballot given to her.
(5c) \((\lambda x. x \text{ wrote on } x’s \text{ ballot}) \text{ Carol; and no one else } \_\_\_\_.\)

contrast can be understood in multiple ways. Additionally, it may be awkward to apply these contrast(s) to thought.

3There is a cluster of views, in linguistics associated most strongly with Reinhart 1983, and in philosophy with Salmon 1986; see also Soames 1985 note 12; Soames 1987, esp. §VIII; Soames 1989/90, pp. 204ff; and Kaplan 1986, pp. 269–71. The specific commitments of these authors differ, but they share a strategy of explaining the linguistic (and sometimes cognitive) phenomena associated with expressions of coordinated belief always in terms of variable binding, as in (3’). It’s not essential to this view that one think that (3) itself has the logical form of (3’)—indeed most of these authors do not. We would however naturally expect a subject who’d express her belief with (3) to also have beliefs of form (3’). So this encourages the idea that variable binding is diagnostic of the phenomena we’re studying, or at least is the dominant phenomenon in the neighborhood. Reinhart’s views have been very influential in the study of anaphora; but see Heim 1998 for a survey of its problems. I will explore the connections between the linguistics and the philosophical side of this family of views in other work.

4Throughout, the \_\_\_\_\_\_ will indicate that a matching predicate has been elided.
The (4) cluster describes a different kind of voting scenario than the (5) cluster. Alice might believe either of these scenarios obtains without believing the other. (The fact that only Carol wrote on her own ballot doesn’t preclude other players also having written on Carol’s ballot.) A straightforward application of the (1’)/(3’) strategy here would tell us that in case (5) Alice is thinking about Carol in a coordinated way; but in (the first conjunct of) case (4c) she won’t yet be doing so. But this last claim doesn’t seem right. As I intend case (4), Alice 

may be thinking of Carol in a coordinated way there, too: contrast the different scenario where she instead has a thought articulable as:

\[(6) \, (\lambda x. x \text{ wrote on Bob}_j \text{’s ballot}) Bob_i; \text{ and no one else } \_\_.\]

Similarly, if Alice has a thought articulable as:

\[(7a) \text{ Bob}_j \text{ won’t vote for Bob}_i, \text{ but Bob}_i \text{ will.}\]

it’s most natural to analyze this as:

\[(7b) \, \neg(\lambda x. x \text{ will vote for Bob}_i) Bob_j; \text{ but } \_\_\_ Bob_i.\]

not as:

\[(7c) \, \neg(\lambda x. x \text{ will vote for Bob}_i) Bob_j; \text{ but } (\lambda x. x \text{ will vote for } x) Bob_i.\]

Yet in (the second conjunct of) (7ab), Alice should nonetheless be thinking of Bob in a coordinated way.\(^5\)

Likewise, if Alice has a thought articulable as:

\[(8a) \text{ Bob}_j \text{ preferred Bob}_i \text{ to every candidate Bob}_i \text{ did.}\]

it’s most natural to analyze this as:\(^6\)

\[(8b) \, \forall z:(\lambda x. x \text{ preferred Bob}_i \text{ to } z) Bob_i. \_\_\_ Bob_j.\]

not as:

\[(8c) \, \forall z:(\lambda x. x \text{ preferred } x \text{ to } z) Bob_i. (\lambda x. x \text{ preferred Bob}_i \text{ to } z) Bob_j.\]

\(^5\)See the discussion of examples (49) and (53)–(56) in Evans 1980; and examples (13) and (20) in Heim 1998.

\(^6\)I express All Fs are Gs as \(\forall z:Fz, Gz.\) In some cases later I will omit the restrictor.
But in (8ab), there should still be some coordination in Alice’s thinking, even though she’s not ascribing the reflexive predicates she is in (8c).\footnote{I just sketched a “straightforward” application of the (1′)/(3′) strategy, and complained that it would count (4c), (7b), and (8b) as not-yet-coordinated ways of thinking about Carol and Bob. A more subtle proponent of this strategy might rather say that the thoughts we articulated in (4ab), (7a), and (8a) should instead be understood to have more complex contents:}

Henceforth, then, I will assume that the difference between coordinated and uncoordinated thinking can’t (always) be attributed to the nature of the predicate one’s thought ascribes. Instead, I will sketch a different way to represent this difference as grounded in the structure of one’s thinking.

**Section 2**

What I’ll be sketching is only a theoretical framework for modeling a subject’s thoughts. As we’ll see in Section 6, the framework can be extended in various ways. Some of these ways are more finely structured (more “linguistic”); others less finely structured (more “logicy”). Which of those extensions is more appropriate will depend on the explanatory work the model is supposed to perform.

To get us started, though, it may help to sketch a radically fine-grained version of the view. This begins with the idea that thought contents are very finely structured, as championed for example by King and others.\footnote{I take King 1996 and 1995 as paradigmatic. See also the later developments of his view, and comparison to other accounts of structured propositions, in King 2007 and 2011.} On their views, the content of Alice’s thought in case (1) would be something like the syntactic structure of the sentence we use to articulate it, except with the leaves labeled by objects and relations, rather than by expression-types.

\footnote{See here Soames 1994, top of p. 260. If the strategy is pushed in this direction, it will end up positing predicates that are more complex than is apparent in sentences we originally took to articulate the thoughts; indeed there is compelling syntactic evidence that those sentences don’t have the forms just displayed. Moreover, one wonders why in the first place we should think multiple occurrences of a bound variable are always suited to represent “coordinated thinking,” but repetitions of other singular terms not. There is much here that will repay closer consideration, but we will have to set it aside for the present discussion.}
To that base, we add the further refinement of “wires” connecting the two occurrences of Bob when Alice is thinking a coordinated thought:

![Figure 1]

and the absence of such “wires” (or “anti-wires”) when Alice is thinking an uncoordinated thought:

![Figure 2]

(What is the relation between the content in Figure 2 and the content:

![Figure 2]

Bob will vote for Bob

Bob will vote for Bob

Bob will vote for self)
Are they the same, at least in this simple case? Does either entail the other? Good questions; but we will bypass them.

If a view of this sort allowed “wires” and “anti-wires” among all of the occurrences of Bob within and across all of Alice’s thoughts (and so too for other objects of her thinking), then it would be one way to concretely realize the general framework I’ll be sketching.\(^9\)

However, for many explanatory purposes we may want a notion of “content” that abstracts away from some syntactic detail. For example, we may want to count the thoughts articulated by:

(9a) Bob will vote for Carol; and Carol will vote for Bob.
(9b) Carol will vote for Bob; and Bob will vote for Carol.
(9c) Bob and Carol will vote for each other.

as having the same (coordinated) contents. We may want to count thoughts like these:

(10a) Bob was afraid to vote.
(10b) Bob feared voting.
(10c) Voting frightened Bob.

as having the same contents, too, despite their varying syntax. The general framework I’ll sketch can also be deployed in these coarser-grained ways, and indeed my preferred implementations will be the ones that follow.

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\(^9\)Such “wires” have been deployed in different ways in philosophy and linguistics, which should not be confused. First, there was Quine’s suggestion in his 1940/1981 that they could be used in place of bound variables. This suggestion is repeated in Kaplan 1986, p. 244, and in Soames 1989/90, p. 204. King 2007 applies the idea to his structured propositions, which have a language-like structure; see his pp. 41–2 and 218–22. One advantage of this device is to abstract away from the alphabetic identity of variables. (Another technique for securing that same advantage, commonly used in writing compilers, can be read about at https://en.wikipedia.org/wiki/De_Bruijn_index.)

The second way in which “wires” have been used is to join positions in a proposition that are already occupied by objects, as a way to distinguish between recurrences of those object that are due to coordination and those that aren’t. Soames 1987 mentions this idea at p. 112, attributing it to unpublished work by Kaplan; and it is appealed to in Fine 2007, at pp. 54–7 and 77–8. Richard 1990 and Larson and Ludlow 1993 posit other mechanisms that can also induce this structure. This is the use of “wires” I was invoking in the text.

The third way in which “wires” (or similarly capable mechanisms) are deployed is in some linguistic work on anaphora. For example, see Evans 1977, pp. 88ff; Higginbotham 1983; Moltmann 2006, pp. 236ff; Heim 1989; and Fiengo and May 1994. (See also Soames 1989/90, pp. 206ff and note 14.) These authors aren’t working with a single notion, but there are notable similarities. Unlike the first use of “wires,” the relations they posit are not restricted to positions that could be bound by a quantifier. (“Donkey pronouns” can also be joined to their antecedents.) Additionally, many of these authors insist that the relations they’re positing aren’t transitive or Euclidean; whereas in the first and second uses of “wires,” we typically see equivalence relations. I believe there are connections between the work done by these third authors and what the second use of “wires” is trying to implement; but those connections need to be developed and defended. We shouldn’t begin with the assumption that the similar-looking diagrams are representing the same thing in each case.
Rather than syntactic tree-structures, we'll instead be working with (a generalized form of) directed graphs. And rather than representing coordinated thoughts with “wires” between multiple occurrences of Bob, we'll instead have Bob occurring just once in Alice's thought-graph (for each presentation Alice has of him). The directed edges will have to “come back” to that single occurrence each time they represent a coordinated thinking about him.

Thus, when Alice thinks the coordinated thought she does in case (3), we'll understand her to have thoughts with the following structure:

![Diagram](11)

and when she thinks the uncoordinated thought she does in case (1), we'll instead have something like this:

![Diagram](12)

To develop this properly, though, we should first review some elementary graph theory.

**Section 3**

A **graph** is made up of one or more **vertices** joined by zero or more **edges**. In some applications, the edges are assumed to be undirected; in others, not. Graphs where all the edges are directed are often called **digraphs**. Graphs may or may not be **connected**:

![Diagram](Figure 4: an unconnected digraph, with three components)

and some vertices may be **isolated**, as the leftmost vertex in the above diagram. But usually edges are not allowed to be disconnected in an analogous way; they are usually assumed to always begin and end at specific vertices. In some
generalizations, though, that we will consider below, this requirement on edges can be relaxed.

The edges in a graph may or may not exhibit **cycles**:

![Figure 5: a digraph with a cycle](image)

But usually **self-loops** starting and ending at the same vertex are prohibited:

![Figure 6: a digraph with a self-loop](image)

That’s not because there’s anything incoherent about self-loops; it’s just that for many customary applications, it’s easiest to assume these are excluded. Similarly, for many applications, it’s easiest to assume there is at most one edge (in a given direction) joining a given pair of vertices. In the following diagram:

![Figure 7: a multi-digraph](image)

the edges on the right would violate this requirement. Again, this is not because there’s anything incoherent about multiple edges joining a given pair of vertices: indeed, the famous Bridges of Königsberg problem, which launched the discipline of graph theory, makes essential use of such. It’s just that for many customary applications, it’s easiest to assume these are excluded. For our purposes, though, we will want to allow self-loops and multiple edges.10

Another requirement we’ll want to relax is that edges must always join exactly two vertices. For some applications, one instead wants to work with structures like these:

10Sometimes such structures are called “pseudographs” or “multi-graphs” rather than just graphs, but the literature is not consistent. A **directed graph** that permits self-loops and multiple edges is sometimes called a “quiver.” State transition diagrams for formal automata are often of this sort. (They also have labelled edges, to be discussed below.)
Notice there is no vertex in the middle of the diagram. This graphlike structure has five vertices and a single edge that joins all of them. Graphlike structures of this sort are called hypergraphs. For these structures, we assume that each edge joins one or more vertices, rather than always exactly two.

The hypergraph in the preceding diagram had an undirected edge; we might instead designate some of the vertices it joins as initial and others as terminal, thus getting a directed hypergraph:

I want to refine these structures in a slightly different way, which involves assigning a linear order to each edge’s vertices. Thus we will instead have something like this:

That’s to be distinguished from:
Figure 11: a simple digraph with a directed path of 4 edges of length 1

Think of the latter structure as involving four different flight bookings; but the former as involving a single booking with three intermediate layovers. For our purposes, we will need the more general, hypergraph structure that allows for both of these possibilities.

For some applications, we want to associate further information with a graph’s vertices or edges. For example, in this (undirected) graph the labels on the edges may represent the cost of traveling between the cities that label the vertices:

Figure 12

Notice we don’t hesitate to assign one and the same label to distinct edges. What’s trickier to understand is that we needn’t hesitate to assign one and the same label to distinct vertices, either. This is because the information labeling the vertex shouldn’t be thought of as constituting the vertex. Rather, we should just think of the vertex as constituted by its position in the graph structure.\textsuperscript{11}

For example, consider the phrase-structure tree of a sentence where the same word appears multiple times:

(13) If dating Carol was stupid, living with her will be more stupid.

A phrase-structure tree can be thought of as a special kind of vertex-labelled digraph, with an additional left-to-right structure imposed on its leaves:

\textsuperscript{11}In many expositions of graph theory, graphs are constructed using set-theoretic machinery from a pre-existing set of objects assumed to constitute the vertices, and an edge relation on them. With such constructions, the present point can be expressed by saying that there need be no relevant connection between the object a vertex is constructed from, and the information that vertex is labeled with. More significantly, though, the notion of a graph can be rigorously understood in other ways, too, that needn’t identify specific pre-existing objects to constitute each vertex.
Notice that the single word-type “stupid” labels two distinct vertices in this graph. (So too do the categories S, NP, and VP.)

Now, you might consider instead saying that it’s the distinct tokens of “stupid” in our inscription of sentence (13) that should label the vertices of its phrase-structure tree. I don’t know what account you’d then give of the syntax of (13)’s sentence-type. But this idea falters even as an account of the syntax of tokens. Consider the following inscription:

If dating Carol was

living with her will be more

(13′)

This contains only a single concrete instance of the word “stupid,” yet it too should have the same syntactic type as displayed in Figure 12. But here we only have a single token of “stupid” to go around. So whether it be type or token, inevitably we’ll have to admit that one and the same object sometimes labels distinct positions in a phrase-structure tree.

Some philosophers distinguish what I’ve here called a token from what we might call an occurrence of the word-type “stupid.” Even if that word has only a single concrete tokening in (13′), they’d say it has two occurrences, one for each of the syntactic positions where the word appears. I have no complaint with that. But don’t think that the occurrences are given to us as distinct objects in advance, out of which we could build the vertices of our phrase-structure tree. Rather,
the distinctness of the occurrences instead already assumes the distinctness of those syntactic positions. And having been given the distinctness of the latter, there is no harm in letting it be the single word-type “stupid” that labels them both.\textsuperscript{12}

Hence, labeled digraphs like this:

\begin{center}
\begin{tikzpicture}
\node (Carol) at (0,0) {Carol};
\node (Bob) at (2,0) {Bob};
\draw[->] (Carol) -- (Bob);
\draw[<->] (Bob) -- (Carol);
\end{tikzpicture}
\end{center}

(14)

should be clearly distinguished from labeled digraphs like this:

\begin{center}
\begin{tikzpicture}
\node (Carol) at (0,0) {Carol};
\node (Bob) at (2,0) {Bob};
\draw[->] (Carol) -- (Bob);
\end{tikzpicture}
\end{center}

(15a)

or:

\begin{center}
\begin{tikzpicture}
\node (Carol) at (0,0) {Carol};
\node (Bob) at (2,0) {Bob};
\draw[->] (Carol) -- (Bob);
\end{tikzpicture}
\end{center}

(15b)

even when it’s one and the same object, Bob, which labels both of the vertices on the right-hand side of diagram (14). The graphs are different because Bob appears twice (that is, he labels two vertices) in the first where he only appears once in the second.\textsuperscript{13}

\section{Section 4}

So how can we use these tools to model Alice’s thoughts?

Let’s suppose she turns her thoughts from baseball to the denizens of Marvel Comics. She doesn’t realize that the individual named “Peter Parker” and the individual named “Spider-Man” are one and the same. Her thoughts may have a structure like this:

\textsuperscript{12}Richard 1990 p. 212 has an example like my (13’). Salmon 2006 n. 4 also emphasizes the difference between tokens and occurrences.

\textsuperscript{13}A useful parallel is the notion of a \textit{multi-set}, which is like a set in being insensitive to order, but like a sequence in being sensitive to multiplicity. The multi-set of vertex labels for graph (14) contains Carol once and Bob twice (in no order); the multi-set of vertex labels for graph (15) only contains each of these labels once.
This represents Alice as thinking *twice* about a single individual (here designated as Peter), who she thinks of in qualitatively different ways. As presented one way, the individual seems to her to be hated by Otto, and (only) to bear the name “Spider-Man”; as presented another way, he (only) seems to her to bear the name “Parker.”

So far, we’re only modeling thoughts whose content involves the atomic predication of a binary relation. Since Alice thinks about Otto standing in multiple relations to Spider-Man, we need to allow her mental graph to join the upper-left vertices with multiple labeled edges. We should also be prepared for her thoughts to join some vertices to themselves: for example, she may believe that Otto praises himself:

![Diagram](image)

Here then would be Alice thinking in a coordinated way about Peter, that both Otto and he will vote him most inadequate hero:

![Diagram](image)

By contrast, here would be Alice thinking about Peter in an uncoordinated way:

![Diagram](image)
Now this picture needs to be extended in several ways. One question is how to represent the difference between Alice’s *believing* and her *intending* that Otto will defeat Spider-Man. The graph:

\[
\text{Otto} \quad \text{will defeat} \quad \text{Peter}
\]

(20)

doesn’t seem to distinguish these. Neither does it distinguish her beliefs from her *deliberate withholdings* of belief (which is not the same as a mere lack of belief or disbelief). A quick fix would be to label the edges not merely with the relation Alice’s thought ascribes, but also with the *attitude* she ascribes it with; but we will suppress this issue for now and give a more considered response later.

A second question is how to represent non-atomic thought contents. Here too, we will give a more considered response later. At present, I only want to allow the further possibility of Alice’s thoughts ascribing (singly) negated relations:

\[
\text{Otto} \quad \text{NOT: will defeat} \quad \text{Peter}
\]

(21)

A third question is how to represent thought contents that ascribe *unary* properties, or relations whose arity is not two. To handle this, we will help ourselves to the ordered hyperedges we saw in Figure 10. For example, here is Alice thinking that Otto will denounce Spider-Man (but not Peter Parker) to May Parker:

\[
\text{Otto} \quad \text{will denounce to} \quad \text{Peter} \quad \text{bears} \quad \text{the name "Spider-Man"}
\]

\[
\text{Otto} \quad \text{won't denounce to} \quad \text{Peter} \quad \text{bears} \quad \text{the name "Parker"}
\]

(22)

Notice that it’s a single (hyper)edge that leads from Otto, makes an intermediate layover at the upper vertex labeled Peter, then proceeds to May; and likewise a single edge that leads from Otto to the lower Peter to May. These two edges are labeled differently, because Alice thinks of Otto, Peter, and May as differently related when she thinks of Peter under each presentation.

Similarly, unary predicates can be represented by labeled (hyper)edges that join only a single vertex: that is, which start there and point off to nowhere:
A fourth question is how to represent Frege-type cases that concern the *predicative* parts of Alice’s thinking, rather than the objects she’s thinking of. One natural move here will shift the ascribed relation from its position labeling an edge into a new, distinguished kind of vertex. That is, suppose that the relations of denouncing and of excoriating are one and the same, but that Alice hasn’t realized this. Then she might think that Otto excoriated Hammerhead without thinking that he denounced him:

![Diagram showing the relations of excoriating and denouncing]

Notice that the relations of excoriating and denouncing here occupy specially marked vertices. We are not conflating Alice’s thoughts with the second-order thoughts that Otto and Hammerhead did and didn’t instantiate the relations of excoriating and denouncing. Those would be represented differently:

![Diagram showing the instantiation of relations]

Here it’s the higher-order relation of instantiating that occupies a special vertex, whereas Alice thinks of the relation of excoriating as just another object. This quick sketch is all I’ll give to indicate how the framework might be extended to model Frege-type cases for the predicative parts of thought; for the remainder, I’ll suppress such issues.

A fifth question is how to represent Alice’s thoughts when they’re partly “empty,” that is, some of their expected objects are missing. A quick fix would be to
represent her thoughts in those cases as joining vertices that lack any label. However, we will spend a little time on this and instead give a more systematic proposal, that can be repurposed when we later turn to the question of how to represent Alice’s quantificational thoughts.

Section 5

The tool we need for this is the notion of a disjoint sum or union. This is a counterpart to the more familiar notion of a Cartesian product. The product of two sets $\Gamma$ and $\Delta$ is a collection of objects each of which designates both an element from $\Gamma$ and an element from $\Delta$. The sum of $\Gamma$ and $\Delta$, on the other hand, will be a collection of objects each of which designates either an element from $\Gamma$ or an element from $\Delta$. Initially, you might think this role could be played just by the ordinary set-theoretic union of $\Gamma$ and $\Delta$. But recall that when $\Gamma$ and $\Delta$ overlap, we say that $(u, v)$ and $(v, u)$ may be different members of their product. In somewhat an analogous way, it will be useful for the counterpart notion of a sum to distinguish between a member that designates $u$ qua element of $\Gamma$ and a member that designates $u$ qua element of $\Delta$. So we define a disjoint sum not as a simple union, but instead as a collection of pairs, whose first element is a tag or index indicating which of the operand sets ($\Gamma$ or $\Delta$) the second element is taken from:

$$\Gamma \sqcup \Delta = (\{ \text{the tag LEFT} \} \times \Gamma) \cup (\{ \text{the tag RIGHT} \} \times \Delta)$$

It does not matter what objects we use as our tags LEFT and RIGHT, so long as they are distinct. These objects may even belong to the sets $\Gamma$ or $\Delta$; no confusion will result. The disjoint sum operation is sometimes represented using the symbols $\sqcup$, or $\sqcup_I$, or $\sqcup_{II}$, or even $\oplus$. In some definitions, the operand sets are themselves used as tags; but this isn’t adequate for the case of taking the disjoint sum of a set with itself, which some applications do want to allow.

In the special case where the lefthand operand is a singleton set containing a special object supposed to represent a FAILURE, Haskell writes:

(26a) (LETFIELD, u), or
(26b) (RIGTFIELD, u),

one would instead write:

(27a) Left u, or
(27b) Right u.

In the special case where the lefthand operand is a singleton set containing a special object supposed to represent a FAILURE, Haskell writes:
(28a) Nothing, or
(28b) Just u

instead of:

(29a) Left failure, or
(29b) Right u.

Similarly, OCaml writes None or Some u. I will follow the Haskell convention.

How can we apply this to the case of Alice’s empty thoughts? Let’s suppose that, though Spider-Man and his kin do exist, non-Marvel-approved substances like kryptonite and phlogiston do not. But Alice doesn’t know this. She thinks, confusedly, that Otto hoards kryptonite. She does not think that he hoards phlogiston. At least, that’s how we’d like to put it. Can we represent this difference in Alice’s thoughts, without any objects such as kryptonite or phlogiston to label her mental vertices?

What we will do is label Alice’s vertices using not the bare objects of her thought Otto, Peter, and so on — elements of the domain Marvel — but instead using members of the disjoint sum { Failure } ⊎ Marvel:

\[
\begin{align*}
\text{NOTHING} & \xrightarrow{\text{bears}} \text{JUST the name "phlogiston"} \\
\text{JUST Otto} & \xrightarrow{\text{hoards}} \text{NOTHING} & \text{bears} & \text{JUST the name "kryptonite"}
\end{align*}
\]

(30)

Notice that the labels of these vertices are no longer the objects of Alice’s thought, even when there is such an object. Alice is not thinking about the abstract construction Just Otto. She’s thinking about Otto. Neither is she thinking he hoards the abstract construction Nothing. There isn’t any object she’s genuinely thinking is hoarded, when she has the thought she’d articulate as:

(31) Otto hoards kryptonite.

Neither is there any object for her to genuinely think about and call “phlogiston.” But we haven’t here represented her as also thinking:

(32) Otto hoards phlogiston.

(Neither does (30) represent her as thinking Otto doesn’t hoard phlogiston, but a different mental graph could do so.)

18
If we want to represent “empty” thoughts in this way, then we’ll need to go back and relabel all our graphs (16)–(25) using labels like the abstract construction \textit{Just Otto} instead of simply \textit{Otto}. Let’s take this as having been done.

Another refinement will be to use as labels not members of the disjoint sum \{\textit{failure}\} \uplus \textit{Marvel}, but instead members of the slightly different sum \{\textit{failure, variable}\} \uplus \textit{Marvel}. The role of this special object \textit{variable} will be to represent not thoughts that lack objects but bound argument positions in quantified thoughts, which we will discuss below. Before we get there, let me help myself to an extension of the convention by which we express (29ab) as (28ab). Instead of:

(29a) \textit{Left failure}, or
(29b) \textit{Right u}, or
(29c) \textit{Left variable},

I will now write:

(28a) \textit{Nothing}, or
(28b) \textit{Just u}, or
(28c) \textit{Var}.

That concludes the basic pieces of the framework I want to sketch. What remains is to discuss:

- different ways the framework can be extended to handle non-atomic thoughts (including quantified thoughts)
- the differences between this framework and paradigmatic neo-Fregean and mental file models of thought
- how this framework can be put to good use, for example in giving a semantics of folk attitude ascriptions

Sections 6–8 are devoted to the first two topics. I leave the third for later work. Section 9 summarizes what I hope to have achieved in this discussion.

\textbf{Section 6}

I have only aimed here at modeling the contentful aspects of Alice’s thinking. Her mental life is shaped by other facts as well: perhaps one of her presentations of Peter comes quicker to mind when she thinks of who Otto interacts with. Some of our explanatory purposes abstract from such details. The framework sketched here represents structural properties that Alice’s thinking shares with other thinkers, where those subcontentful details are different.
As I said in Section 2, what I’m offering is deliberately incomplete. How it should be extended depends on our explanatory needs. In some settings we may want to model Alice’s thinking in a fine-grained way. Perhaps not every syntactic detail from how she articulates her thoughts should be mirrored in the thoughts themselves; but we may want a model that tends in that direction.

If that’s what we want, then we can extend the framework sketched above in the following way, to handle thoughts with non-atomic contents. First, connectives like or and and could be modeled by introducing labeled edges that join not vertices but other edges. Here might be Alice’s thought that Otto or Spider-Man will eventually defeat the other:

(33)

Using the tools introduced in Section 5, we could model the quantificational thought that most villains will either defeat or be defeated by Spider-Man like this:

(34)

This quick sketch should give enough of a feel for the idea. Rather than developing it further, let’s instead think about alternative ways to extend the framework, that are more coarse-grained and encode less language-like structure into Alice’s thinking—though they do still preserve the difference between coordinated and uncoordinated thinking. In some settings, this may suit our explanatory needs better.

Let’s suppose the coarseness of grain we’re aiming for is to identify all of Alice’s thoughts (under a given attitude) having the same prenex/disjunctive normal form. Thus, the thought she’d articulate as:

(35) If there is a villain who likes pumpkins, many children will be delighted but Spider-Man will not.

will be equivalent to:

Such structures are also used in Johnson and Postal 1980.
(36) ∀x. Many y. (¬Villianous x) ∨ (¬Likes pumpkins x) ∨ (Delighted y ∧ ¬Delighted Spider-Man)

For this variation, we will return to graphs as described in Sections 4 and 5. Here the edges only represent Alice’s atomic thought contents, except we’re also allowing them to represent (single) negations of such. Each (hyper)edge joining n vertices has a direction or order for those vertices, as well as what we might call a “polarity,” indicating whether the n-ary relation it’s labeled with is thought by Alice to hold or to not hold. Let’s extend this by also supposing each edge to have one or more “colors.” My idea here is to impose a cover on all the edges in Alice’s mental graph. A cover of E is a collection of non-empty subsets of E whose union exhausts E; that is, it is like a partition except that cells in the cover are permitted to overlap. The metaphor of “coloring” the edges is just a vivid way to think of this. Each “color” represents an additional cover-cell to which the edge belongs. (We don’t rely on any other facts about the “colors” besides their identity and distinctness.) The point of these cover-cells will emerge in a moment.

If you look at the form of Alice’s thought (36), you’ll see that it involves a sequence of quantifiers, surrounding a disjunction each of whose disjuncts is a conjunction (of one or more terms). Each conjunction can be identified with a set of atomic (or singly negated) predications. We will associate each such conjunction with a new color. (If a given conjunction recurs in other thoughts, the same color should be re-used.) Then the disjunction can be identified with a set of colors.16

Hence, the quantifiers aside, Alice’s thought (36) might be modeled like this:

(37)

One of the Var vertices corresponds to the bound variable x in (36), and the other to the bound variable y. The complex disjunction which is inside the quantifiers in (36) can be represented by the graph displayed in (37), together with the set of colors {red, green, blue}. To get Alice’s whole thought, we have to also specify the surrounding quantifiers. This can be represented by an ordered sequence of zero or more pairs, each pair consisting of a quantifier and some Var-labeled vertex in the graph. And we should also specify the attitude under

16We are ignoring differences between q ∨ (r ∧ s), (s ∧ r) ∨ q, and so on. This is in keeping with the coarse-grained aims of the present approach.
which Alice thinks the thought in question: does she believe it? intend for it to be true? remember it? or what?

Altogether, then, we can define an attitude triplet to be a triple of an attitude, a sequence of zero or more (quantifier, Var-labeled vertex) pairs, and a set of colors. Given a graph as in (37), each such triplet will represent one of Alice’s thoughts; and a set of them can represent all her thoughts. Coordination relations can be identified between her thoughts, as well as within them, because those thoughts will involve edges joining a common vertex in the underlying graph. Again, this is just a quick sketch, but it should give enough of a feel for the idea.

I’m deliberately not advocating one of these variations over the other, because I think Alice’s thinking will plausibly have each of the structures described: both the fine-grained one and the coarser-grained one—and presumably others too. Different theories may want to make use of different structural properties of her thought. What unites the different models I’ve sketched here is their shared strategy of representing the difference between coordinated and uncoordinated thinking in terms of how many mental vertices are present in the underlying graph. (As opposed to the “wires” and “anti-wires” in Figures 2 and 3.)

Section 7

The framework I’ve sketched looks very different from mental file and neo-Fregean theories we’re more familiar with. But perhaps these differences are merely superficial?

It should not be difficult for a mental file theorist to take on board the machinery proposed here. The major difference is that in our framework, Alice’s memories, information, and attitudes are distributed across thought structures, that may involve multiple “files” or vertices, rather than being contained inside each file. This gives a more satisfying representation of thoughts that predicate \((n > 1)\)-ary relations. If we had to bundle Alice’s relational thoughts about Otto into a single file, how should that information latch onto Alice’s presentation of Peter as Spider-Man rather than his presentation as Peter Parker? Minimally, we’d have to take care to distinguish her thoughts about Otto’s relation to the person Peter Parker, so presented, from her thoughts about that mental presentation—but this is easy enough to do using the machinery we saw in Section 5. More awkward would be questions why the model is entitled to fill Alice’s Otto file with “information” that concerns her other mental files in a way that’s itself immune to reference-failure and Frege mistakes.\(^{17}\) These issues may not be insuperable

\(^{17}\)In a Unix-type filesystem, a file is individuated by what device it resides on and its “inode number.” (Pathnames can’t individuate files, because they can stand many 1 to inodes.) In general, an application or even the whole OS may not be in a position to tell whether “two” devices host distinct filesystems, or are merely a single filesystem being accessed via two routes. So even to the computer, numerical identities between files need not be luminous or transparent.
for a mental file theorist, but I expect that satisfactory answers to them are just going to recapitulate the structure of the framework I’ve sketched.¹⁸

Neo-Fregeans can also agree with some parts of our framework. Or at least, our framework seems capable of representing things they want to say. Information that Alice associates with Peter, when presented in a given way, is represented in her graph by the edges incident with that Peter-labeled vertex. For example, the presentation of Peter deployed in her thought (36) is connected with the information that he is named “Spider-Man” and that he slings webs—even though this additional information isn’t itself part of her thought (36). (That’s why those edges in (37) weren’t colored red, green, or blue.) Nor are Alice’s associations limited to beliefs: the edge that associates Peter with web-slinging could be part of a suspicion, or an intention, or some other attitude. So this framework seems hospitable to the neo-Fregean’s ambition to capture the informational and attitudinal differences between Alice’s different presentations of Peter.

Still, I count it as an advantage of our framework that is does not force us to say that Alice associates rich bodies of information with every mental vertex. Her presentations can manage to be separate even when the information she associates with them is comparatively thin, and in particular falls short of being uniquely identifying.

Indeed, her vertices or presentations can differ even when they’re associated with all the same information and attitudes. As I suggested at the outset, Alice’s two presentations of Bob in case (1) might differ merely numerically, as do the vertices on the right-hand side of diagrams (14’ and (38):

![Diagram](image)

So, though our framework can accommodate all the associations and fineness of grain a neo-Fregean wants, adopting it may undermine, or at least relieve

¹⁸Other ways the mental file theorist may need to bend to take on our framework are to allow files that have no referent, files that are not even believed to have a referent (like the Var-labeled files in (34) and (37)), and the possibility of distinct but indiscernible files. This last point tells us that files can’t be identified with the qualitative content of the information they bundle together; see below.
the motivational pressure for, paradigmatic neo-Fregean claims about how much associated information is available.

Should we want our models of Alice’s thinking to have the capacity to represent merely numerical differences in her presentation of a single object? Is it really intelligible for her to have multiple presentations of Bob that are “qualitatively indiscernible”—that is, unaccompanied by any qualitative difference in her associated memories, information, or attitudes? (As in (38), we allow there to be networks of further numerical differences in what other (also qualitatively indiscernible) vertices they are adjacent to. The upper Bob Jr vertex is joined only to the upper, and not also to the lower, Bob Sr vertex.)

Here are several cases to motivate the intelligibility of this.

Suppose Alice has a vivid dream of a distinctive-looking woman, and remembers the experience. The dream did not present itself to her as being of anyone she was already familiar with. We can suppose also that it did not present itself to her as being dreamt, or at any rate that over time she forgets that this experience came from a dream. Later in life she has a perceptual experience that exactly qualitatively matches the dream experience. Most will agree that it’s possible for the dream not to have been a prescient presentation of the same person she later perceives. Intuitively, neither do these two experiences need to be coordinated. It can be an open epistemic question for Alice whether these two presentations were of a single individual. Twisting the case, we can further suppose that the later experience was in fact itself a hallucination. That doesn’t seem to make the two presentations any less distinct. We can also suppose that as time passes, Alice forgets which experience came first, whether one was dreamt and the other apparently perceptual, or what. They might nonetheless remain distinct presentations to her. Yet no merely qualitative information contained in the presentations may differentiate them. For a final twist, we can suppose that Ellen is a mental duplicate of Alice as she is now, but in Ellen’s case, the two memories of a distinctive-looking woman never were generated from distinct experiences. She only ever had a single experience, but through some signaling glitch in her brain, now has cognitively distinct memory presentations, just like Alice. If Alice or Ellen were to revise one of their memories, it would change autonomously. The other presentation would remain as it is. 19

Suppose Flugh is an alien whose many eyes are on long stalks, which can wriggle quite a way through the maze of twisty little passages where he lives. The experiences generated by his eyes are co-conscious, but not always spatially integrated. In particular, on one day he has two qualitatively matching experiences of a homogeneous sphere, without any presentation of how the spheres are spatially related to each other. Neither experience even seems to be above, or to the right,

19See the discussion of Mates cases and similar issues in Fodor 1994, pp. 105–9 and Fodor 1998, pp. 16–17, 37–39. Fodor’s picture seems to be that cognitive differences may just be grounded in brute numerical differences between mental symbol types. See also Richard 1990, pp. 183–5.
of the other. As it turns out, Flugh is seeing only a single sphere. In fact, it may be that he’s only seeing a single sphere with a single eye, but through some signaling glitch in his brain, he now has cognitively distinct mental presentations. That is, Flugh is in a position to wonder:

(39) Is this sphere the same as that one?

Perhaps Flugh would be in a position to introduce some difference in how he thinks of the two spheres. Perhaps he could start thinking of one of them as the sphere I’m attending to in memory right now. But suppose he hasn’t yet done any such thing. Couldn’t his two sphere-presentations then be qualitatively exactly alike, but nonetheless cognitively distinct presentations? In response to such cases, some of my interlocutors protest that the subjects would only be thinking plurally about a pair of women, or a pair of spheres, and wouldn’t be in a position anymore to think about each element of the pair separately. (Recall our opening remarks about (1) versus (2).) I acknowledge there can be cases of that sort. But I don’t see why our cases must take that form. This diagnosis sounds especially forced for the dreamt woman case, where the two presentations never need to have occupied Alice’s attention simultaneously.

Consider also this. Flugh may know that spheres have invisible properties, let’s call them even-centeredness and odd-centeredness, which are roughly equally distributed. If he’s confident that the spheres he seemed to see are distinct, then it seems that two lines of hypothetical reasoning should be open to him. One would go: Suppose at least one of the spheres is even-centered, then the probability that they’re both even is \( \frac{1}{3} \), because in \( \frac{1}{3} \) of the cases where at least one of two independent spheres is even-centered, they both are. But there’s also another line of reasoning available to him. It would go: Call one of the spheres X. (Perhaps here he calls to mind and attends to one of his sphere images; or perhaps he doesn’t.) Suppose it is even-centered. Then the probability that they’re both even is \( \frac{1}{2} \) — again because the centeredness of the other sphere is an independent matter. Both of these seem to be legitimate courses of reasoning.

Both of these matters for Flugh to sort out when he should deploy the one line of reasoning and

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20 I devised such a creature many years ago as a prophylactic against the tendency to think that co-conscious perceptual experiences always had to have a single perceptual viewpoint. Interlocutors have pointed out to me that the present example turns out to be essentially the same as David Austin’s “two tubes” example in his 1990. I prefer working with an alien example, because we need the subject to have two disjoint visual fields, and it’s hard to imagine a real contemporary human’s phenomenology being like that. If you try Austin’s experiment yourself, you’ll find that your visual experiences still are presented as spatially related: one of the apparent spots will look to be to the right of the other. Austin’s case has been discussed by many authors, including Levine 1988, Boër 2007, Chalmers 2012, Sainsbury and Tye 2012. See also the example of the “two Bruces” in Fine 2007, pp. 36–7, 71.

21 (Footnote to be added about centered contents and multi-centered contents.)
when the other. But even making sense of the intelligibility of the second line of reasoning suggests that Flugh will have, at least temporarily and suppositionally, the ability to think about his “two” spheres independently.\footnote{These issues are explored in a way in Stalnaker 2012. Thanks to Dan Hoek for discussion, and encouraging me to press these issues. Also relevant is the linguistics literature on “indistinguishable participants,” in sentences like Kamp’s “If a bishop meets another bishop, he blesses him.” These were first discussed in Heim 1990.}

Section 8

I’ll close with some questions, and some replies.

First, suppose neo-Fregeans are prepared to accept the possibility of merely numerical differences in Alice’s presentations of Bob. How much of a departure need this be from more familiar versions of their view?

Some neo-Fregeans will already insist on the possibility that modes of presentation be “non-descriptive.” Often what this seems to mean is only that the subject may lack concepts or the language to articulate information that her presentations can nonetheless associate with an object. I haven’t made any effort to exclude or include this in our framework. If we did want to specially keep track of such “non-descriptive” modes of presentation, though, they’d presumably have to do with what labels the edges of Alice’s graph, not with the number of indiscernible vertices she can have. As I’d put it, this is only an issue about which qualities Alice’s presentations can ascribe, or perhaps the formats by which she grasps those qualities. What I’m after is more radical: the possibility of presentational differences that exceed any differences in associated qualities.

Some neo-Fregeans like Evans will also already insist on the possibility that presentations may be qualitatively indiscernible but distinct, because they are presentations of different objects—or at least, presentations grounded in different ways of gaining information from an object. This is a step in the direction I’m after. But I want to go further in that direction than I expect Evans would. In our examples in the previous section, Ellen and Flugh only gained information in a single “way,” but due to signaling glitches that information was cognitively “forked,” and they then have multiple presentations downstream.

Let’s suppose the neo-Fregeans are willing to accommodate all of this. All my examples motivate, they may say, is the possibility that senses may differ \textit{solo numero}. This may be a relatively novel variety of neo-Fregeanism, but why shouldn’t it belong to their family of views for all that?

Indeed, that would grant most of what I’m after. If you think of yourself as a neo-Fregean, and you can understand the proposals I’m making as refinements of your own view, I see no pressing need to resist that. The only reservation I have about this way of framing my view is this. If Alice really does have two numerically distinct but qualitatively indiscernible presentations of Bob, and these presentations are reasonably thought of as two \textit{particular senses}, then
mightn’t it make sense to talk about two (or more) possible situations, in which these particular senses are permuted. I don’t think that ought to make sense. I don’t think there has to be anything in the mental reality we’re modeling—at the level of abstraction we’re modeling it, which may be shared between Alice and others who realize the same mental structure in concretely different ways—that would underwrite the possibility of there being meaningful differences in such permutations. Properly understood, a graphlike way of talking about Alice’s mind should deliver the same result. There is no graph-theoretical difference between our graph (14′) and a “different” graph in which the two right-hand vertices have been permuted. If we talk about particular senses, though, I worry that these permutational differences ought to be genuine possibilities. At least, I think we’d have to do work to earn the right to say that permuting the senses makes no difference. If we can achieve an understanding of indiscernible but numerically different senses where such permutations aren’t genuinely different possibilities, then okay, we’re just doing graph theory in other vocabulary.

Second, in presenting this framework and sketching different ways it may be fleshed out, I’ve only been specifying what it is for an agent to have a given set of attitudes at a single time. I haven’t said anything about what it would be for the agent to retain some of those attitudes while revising others. Nor have I said what it would be for the agent to share some of those attitudes, but not others, with other agents. I point this out to counter the impression that the framework developed here must give holistic answers to those questions: that the only kind of mental overlap it would allow would require sharing entire mental graphs. Not so. This framework can be developed that way; but it is also compatible with various stories about when agents share more local, specific mental structures.

One especially hard version of the preceding questions concerns the mental relations between Alice, who has two presentations of Bob (and Peter and other objects), and another subject Daniel who has only a single presentation. When Daniel thinks about Alice’s thoughts, should he associate her Bob presentation with his own unitary presentation of Bob? What then should he associate her other, Bob’j presentation with? These are complex issues and I mention them here only to disavow any ambition for the present framework on its own to be adequate for answering them. An answer will have to come from a fuller story about the semantics of our talk and thought about others’ minds. I do believe the present framework is a useful tool to be used in such a fuller story, but that will have to be shown elsewhere.

For the time being, it’s only being offered as a model of a single agent’s mind at a single time.

Third, earlier I said that coordinated thinking should be represented with a common vertex, like this:
and uncoordinated thinking with multiple vertices, like this:

(11)

But what if the agent has multiple vertices but believes the objects so presented to be identical? That is, what is the difference between (11) and:

(12)

I expect that subjects can have attitudes like that, attributing identity to objects thought of in uncoordinated ways. So I’ll agree that (12’) represents a possible mental state, distinct from (11). Depending on what attitude it represents the subject as having, it may even be a rational state—for example, if the agent isn’t fully, indefeasibly certain that the identity holds. If she were that confident that the identity held, but persisted in thinking of the objects uncoordinatedly, then I’m inclined to count her as thereby manifesting some irrationality. So: (12’) does represent even a possible state of maximal belief, distinct from (11), but perhaps not an “ideally rational” one.

There can also occur cases where the agent does aim to think of an object coordinately, but has unknowingly latched onto multiple referential candidates. In such cases, I’d posit a single vertex, labeled in some special way to indicate that the referent is indeterminate between the several candidates. (Here again

\[ (11) \]

\[ (12) \]

\[ (12’) \]

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23 In response to a question whether the woman who just left was Carol, suppose someone answers “She put on Carol’s coat, you figure it out.” Here the pronoun “she” and the name “Carol” won’t show the linguistic markers that we might expect to go with expressions of coordinated belief. At the same time it seems the speaker did believe, and intended to be understood as implying, that these terms corefer. For discussion of such examples, see Higginbotham 1985 p. 570; example (12) in Heim 1998; and Fiengo and May 1994 Chapter 1.  

24 Though, as I argue in other work, that’s not to say that a more rational state will always be available to her. Further, as Ned Block observed, it may not be under the subject’s rational control whether her mind organizes itself in way (11) or way (12’).
we can use the tools introduced in Section 5.) That would need to be clearly separated from vertices with plural referents, which we will also sometimes want. The framework sketched here naturally lends itself to such amplifications. The difficulties to be faced concern what theoretical constraints and predictions we should be making with those notions, not how to get the formal model to express them.

Section 9

[What I hope to have accomplished in this discussion...]

References

David Austin, *What’s the Meaning of “This”?*, Cornell 1990
Gareth Evans, “Pronouns, Quantifiers, and Relative Clauses (I),” CJP 7 (1977), reprinted in Evans 1985
Gareth Evans, “Pronouns,” LI 11 (1980); reprinted in Evans 1985
Irene Heim, “E-Type Pronouns and Donkey Anaphora,” L&P 13 (1990)


Dilip Ninan, “Self-location and other-location,” PPR 87 (2013)


François Recanati, *Mental Files*, Oxford 2012


Nathan Salmon, “Reflexivity,” NDJFL 27 (1986); reprinted in Salmon and Soames 1988


Nathan Salmon and Scott Soames, eds., *Propositions and Attitudes*, Oxford 1988


Scott Soames, “Pronouns and Propositional Attitudes,” PAS 90 (1989/90)
