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An empirically-informed cognitive theory of propositions

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Scott Soames has recently argued that traditional accounts of propositions as n-tuples or sets of objects and properties or functions from worlds to extensions cannot adequately explain how these abstract entities come to represent the world. Soames' new cognitive theory solves this problem by taking propositions to be derived from agents representing the world to be a certain way. Agents represent the world to be a certain way, for example, when they engage in the cognitive act of predicating, or cognizing, an act that takes place during cognitive events, such as perceiving, believing, judging and asserting. On the cognitive theory, propositions just are act types involving the act of predicating and certain other mental operations. This theory, Soames argues, solves not only the problem of how propositions come to represent but also a number of other difficulties for traditional theories, including the problem of *de se* propositions and the problems of accounting for how agents are capable of grasping propositions and how they come to stand in the relation of expression to sentences. I argue here that Soames' particular version of the cognitive theory makes two problematic assumptions about cognitive operations and the contents of proper names. I then briefly examine what can count as evidence for the nature of the constituents of the cognitive operation types that produce propositions and argue that the common nature of cognitive operations and what they operate on ought to be determined empirically in cross-disciplinary work. I conclude by offering a semantics for cognitive act types that accommodates one type of empirical evidence.

Keywords: act-based theory of propositions; cognitive significance; cognitive theory of propositions; hyperintensionality; unity of the proposition

1. The problem of intentionality

Scott Soames has recently argued that traditional accounts of propositions as n-tuples of objects and properties or functions from possible worlds to extensions cannot adequately explain how these abstract entities come to have intentional properties that enable them to represent the world as being a certain way (Soames 2010, 2012, 2013a, 2013b, 2013c, 2013d). Let's call this 'the problem of

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intentionality'. I shall here use the phrases 'representational' and 'intentional' (with a 't') synonymously.

Frege (1892a, 1892b, 1918) and Russell (1903) took propositions to be structured entities with a structure that mirrors the sentences that express them, at least in an ideal language. Moreover, they took propositions to be the primary bearers of truth. When we say of a sentence, utterance or belief that it is true, then this is to be understood derivatively. A sentence is true in virtue of expressing a proposition that bears a truth-value. Propositions have their truth-values in virtue of representing the world to be a certain way. If they represent correctly, they are true; otherwise, they are false. Other entities, such as beliefs and judgments, represent only in virtue of being related to propositions with inherent intentional properties.

According to Soames, the problem Russell and Frege faced was that of accounting for how in an abstract propositional entity, such as *o is red*, redness is predicated of o in a way that results in o being represented as red. If the proposition simply consists of the object o and redness, then how does it come about that it's redness that is predicated of o, and not vice versa? A simple answer would be to say that the proposition itself specifies what is predicated of what but if this were so, then the relation of predication would need to be a constituent of the proposition, which it is not. While the sentences 'o is red' and 'redness is predicated of o' may be taken to express the same proposition, the complexes *o is red* and *redness is predicated of o* are two different propositions with potentially different truth-values. The reason that these complexes are different propositions is that, on a Russellian or Fregean account, propositions are exhausted by their constituents and perhaps a structure that supervenes on properties inherent to the constituents of the proposition.

Frege (1892b) made an attempt to solve the problem of intentionality by proposing that different constituents inherently function as either a subject or a predicate. In *grass is green*, for example, *grass* can only function as a subject and *green* can only function as a predicate. So, it is inherent to the proposition that *green* is being predicated of grass and not vice versa. This means that *green* cannot occur as a constituent of which something is being predicated. This restriction on predicative constituents of propositions has independent motivation (see Brogaard 2006). Consider the sentences:

(1) Green is a concept
(2) *Green* is a concept

(1) appears to express a *false* proposition that (on, say, a physicalist theory of color) wrongly predicates *being a concept* of the color green, whereas (2) appears to express a *true* proposition that truly predicates *being a concept* of the sense associated with green. But a Fregean cannot straightforwardly accept propositions of this sort. For Frege, the constituents of propositions are not objects and properties but senses (or modes of presentation or concepts). (1) and (2) thus appear to contribute the same conceptual constituents to the propositions:

The sense corresponding to 'green' and the sense corresponding to 'a concept'. But if propositions are the primary bearers of truth, then two sentences with different truth-values cannot express one and the same proposition. If they did, then there would be no fact of the matter as to whether the proposition in question is a true proposition about the concept green or a false proposition about the color green.

There is some evidence that Russell took this type of problem to be a serious problem for his own theory of denoting concepts, which he defended in *Principles of Mathematics*. In paragraph 38 of "On Fundamentals" (p. 383 of Vol. 4. of Russell's *Collected Papers*), for example, in which Russell rejects the theory of denoting concepts, he seems to rely on the problem of indeterminate propositions to argue against the view that denoting concepts are capable of occurring in different kinds of ways (e.g., denotatively or non-denotatively) in different propositions. In reply to the above argument it may be suggested that the two occurrences of 'green' in (1) and (2) contribute different conceptual constituents to the propositions expressed. This suggestion, however, has a number of independent problems that appear to have motivated the Gray's Elegy argument, which Russell presents in 1905 in "On Denoting" as a final argument against his earlier theory of denoting concepts (Brogaard 2006).

Frege himself does not run into this problem, as he does not think sentences like (2) are intelligible. According to him, it is impossible for the sense of a predicate to be the same as the sense of a singular term. Frege's proposal, however, has numerous problems. To mention one, if different constituents of propositions inherently function as either a subject or a predicate, then we cannot intelligibly express the core of Frege's theory that what is expressed by a singular term is a mode of presentation.

Soames thinks that Russell and Frege were looking in the wrong place for a solution to the problem of the intentionality of propositions. They were looking for a relation that holds the constituents together to form a single entity, thinking that an answer to that question would also provide an answer to the question of the intentionality of propositions. However, Soames argues, if the problem of how propositions represent could be solved by finding a relation of this kind, then we would already have a solution to the problem. If the constituents of propositions form a set, for example, then they are unified by the relation of being members of that set. The real problem, though, is that of explaining how propositions can be non-derivatively representational. But this problem, Soames says, cannot be solved if the entities that are supposed to play the role of propositions are Russellian or Fregean structures, as there is nothing inherent in these structures that makes them representational. What makes something representational is the relation of predication. But a structure of the kind that is supposed to play the role of the proposition for Frege and Russell does not contain constituents that ensure that one thing is predicated of another, because predication is something only agents can do.

Because predication is something that only agents can do, it does not help to reject the Russell/Frege picture of propositions as n-tuples or sets of entities and

turn to possible worlds or functions from worlds to extensions to solve the problem. Neither sets of worlds nor functions from worlds to extensions are intrinsically representational. If an account has already been offered of propositions as intentional entities, propositions can then (perhaps) be modelled as sets of worlds or their characteristic functions, but neither sets of worlds nor their characteristic functions can possess the properties it takes to make them represent anything non-derivatively.

2. A cognitive theory of propositions

Soames' response to the problem of what makes propositions inherently representational is to deny that they are *inherently* representational (Soames 2012, 2013b). According to Soames, the basis of all representation (intentionality) is the perceptual and cognitive activity of agents. The representational properties of propositions derive from the representational activities of agents. Agents represent the world as being a certain way when they predicate something of something else. For example, an agent represents an object o as being red when she predicates redness of o. All instances of event types, such as seeing o as red, imagining o as red, judging that o is red, and asserting that o is red, are instances of the event type *cognizing o as red*, which is identical to the event type *predicating redness of o*. All the event tokens involve a distinctive kind of cognizing, viz. that of predicating redness of o, in addition to other cognitive acts. To judge or assert that o is red is to predicate redness of o and to endorse that o is red, where predicating and endorsing are two distinct cognitive acts.

According to Soames, propositions are associated with act types of predicating. For example, all the acts of predicating redness of o correspond to the proposition that o is red. Soames actually takes propositions to be identical to act types. So, the proposition that o is red is identical to the act type of predicating redness of o. In my view, that conflates the act of doing something with the information that is produced during the act. When you retrieve a memory, perceive something or make a belief explicit, information is thereby being processed. This cognitive processing generates new information. So, cognitive acts are mental doings that produce information. A cognitive act type is a class of mental doings that consist in the same kind of doing and lead to the same kind of information. For example, the act type of predicating greenness of grass produces the information that grass is green. The act type of predicating greenness of grass is the class of all conceivable acts that predicate greenness of grass. So, I think that rather than saying that propositions are identical to certain act types (e.g., the act type of predicating), it would be more accurate to say that propositions are the information produced by these act types. But I don't think a lot hangs on whether we use this wording or Soames'. So, I will mostly use Soames' particular suggestion in what follows.

The act type of predicating a property of an object is representational, Soames says, because every conceivable instance of it is one in which an agent represents

something as being a certain way. The representational properties of the type are essential to it. The act type could not be what it is without having the intentional properties it has. So, propositions inherit their representational properties, not from a particular cognitive act, but from all conceivable instances of a certain type of cognitive act. Propositions represent what is representationally common to all such instances.

According to Soames, the verb phrase 'predicating of' is to be understood as an intensional, transitive verb. This means that the object of the cognitive act of predicating doesn't need to exist in order for the act to produce an instance of a proposition. For example, the act of predicating maleness of the King of France does not require the King of France to exist. So, the existence of the proposition that the King of France is male does not require the King of France to exist either. The proposition just cannot be true without the existence of a King of France. Soames is not suggesting that acts of predicating involve predicating something of a Meinongion non-existing entity but only that 'predicating of' expresses a cognitive relation between an agent, a property, and a content.

Once we have a picture of propositions as inheriting their representational properties from the cognitive activities of agents, we can speak, derivatively, of propositions themselves representing the world as being thus and so, for example, we can speak of the proposition that o is red as representing o as red.

Complex propositions derive their representational properties from the cognitive acts of agents in the same way as atomic propositions. The cognitive acts resulting in complex propositions involve acts of predicating, acts of employing truth-functional operations and other related cognitive operations. For example, the proposition that it is not true that o is red results from an act of predicating redness of p, negating the property of being true, and predicating that property of the result of the initial act of predicating, and the proposition that o is red and round is generated by conjoining the properties of being red and round and predicating the result of o. Conjunctive and disjunctive propositions may come from the act of applying the operations of conjunction and disjunction to the results of predicative acts. For example, employing the disjunctive operation to *a is red* and *b is round* results in *a is red or b is round*. Complex propositions inherit their representational properties from both acts of predicating and other acts, such as conjoining, disjoining and negating properties or propositions.

The roles the constituents joined together play in the sequence of cognitive operations determine the structure of propositions. (Soames 2013b, 46). By 'roles' Soames means things like being predicated (of certain things), being targets (of certain predications), being applied (to certain arguments), being arguments (to which certain things are applied), etc.

According to Soames, the cognitive theory of propositions has several attractive features. First, it does away with the problem of intentionality. The answer to the question of how propositions come to have representational properties is that they derive from the cognitive activities of agents. It's agents who most fundamentally represent things as being a certain way. When agents

represent, their acts of predicating (or cognizing) thereby become representational, and these acts result in instances of propositions with representational properties.

Second, the cognitive theory offers a naturalistic picture of what it is to bear epistemic relations to propositions, sometimes expressed using terminology such as 'grasping a proposition', 'being acquainted with a proposition', and so on. On the Russellian and Fregean accounts of propositions, it is somewhat mysterious how we can come to stand in these epistemic relations to abstract entities. On the cognitive theory, by contrast, we come to stand in these relations by performing cognitive acts of cognizing. When agents perform cognitive acts of cognizing, they thereby entertain a proposition. The notion of entertaining a proposition may seem to require a notion of a proposition that is independent of the cognitive act of entertaining. However, this is not how Soames' suggestion should be understood. Although we speak of 'entertaining a proposition', the act of entertaining is a cognitive act the performing of which gives rise to an instance of the proposition. As Soames puts it, 'To entertain p is not to have p in mind or to cognize it in any way; it is to perform a cognitive act resulting in an instance of p.' (Soames 2013c, 7)

Third, the cognitive theory makes the relation of expression between sentences and propositions less mysterious. The act types of predicating and other types of cognitive operation serve as the interpretation of sentences and utterances. Users of the language learn to associate certain sounds with certain mental representations and cognitive acts linking these mental representations together. Once this skill has been acquired a speaker will, in most circumstances, more or less automatically perform a cognitive act of predicating when uttering a sentence. As this cognitive act of predicating produces an instance of a proposition, the utterance of the sentence can then be said to express that proposition. In some cases the tokening of a sentence may overlap significantly with the tokening of the act of predicating; for example, if I have a thought explicitly in English, we might say that I am both tokening a sentence and an act of predicating. In those cases, the very act of tokening the sentence may simultaneously amount to an act of predicating. As Soames puts it,

> *When an event is an instance of both a sentential and a propositional type, there is no extra inner event of "grasping the proposition" over and above using the sentence meaningfully.* So, when S expresses p, one who understands S can entertain p by tokening S. For some propositions, this may be our only feasible way of entertaining them. In such cases what distinguishes p from S is the *possibility* that an event could be an instance of one but not the other. More generally, the heretofore mysterious *expressing* relation holding between a sentence and a proposition may be grounded in something like the *by* relation that holds between two things that are done when an agent can do one of those things (entertaining the proposition) by doing the other (uttering or inscribing the sentence). (2013b, 23)

Fourth, the cognitive theory of propositions can help us solve several puzzling semantic phenomena, including the problem of substitution into

hyperintensional contexts and the problem of de se propositions. I will go over Soames' treatment of the latter two puzzles in some detail, as my critique in subsequent sections will have some bearing on what he says about these examples. As examples of substitution into hyperintensional contexts, Soames presents the following pair of examples:

(3)
(a) Russell defended logicism
(b) Russell defended the proposition that arithmetic is reducible to logic.
(4)
(a) Mary believes that Russell defended logicism
(b) Mary believes that Russell defended the proposition that arithmetic is reducible to logic.

As 'logicism' is a proper name for the proposition that arithmetic is reducible to logic, the two expressions are necessarily equivalent, so the latter can be substituted for the former in 3(a) without a change in truth-value. But this is not the case in 4(a), because 'believe' is a hyperintensional operator, an operator that does not allow for substitution of necessarily equivalent propositions within its scope.

A good theory of propositions should be able to explain this substitution failure. Soames explains the above case as follows. Entertaining the embedded proposition in 4(a), for example, by believing it, requires possessing the name 'logicism' but does not require knowing its precise referent. So, a cognitive agent may be able to entertain and believe the embedded proposition in 4(a) but be unable to entertain and believe the embedded proposition in 4(b). Event types from which propositions derive can thus impose different conditions on the cognitive operations it takes to entertain them, even when the propositions are necessarily equivalent and what Soames calls 'representationally identical'; they are representationally identical 'in the sense that their truth conditions are derived from predicating the very same properties of the very same things' (2013b, 25).

Soames exemplifies the problem of de se propositions, also known as the 'problem of the essential indexical', using Perry's well-known example of the messy shopper.

> I once followed a trail of sugar on a supermarket floor, pushing my cart down the aisle on one side of a tall counter and back the aisle on the other, seeking the shopper with a torn sack to tell him he was making a mess. With each trip around the counter, the trail became thicker. But I seemed unable to catch up. Finally it dawned on me. I was the shopper I was trying to catch. (Perry 1979)

The problem is to explain what about Perry's belief changed when 'it dawned on him' that he was the messy shopper. All de se cases involve believing or asserting in a special first-person or immediate present tense way, whereas de re and de dicto cases involve believing or asserting in a neutral way. Perry argues that though it may seem that he comes to believe something new when it dawned on him that he was the messy shopper, this is not really the case. Rather, he comes

to believe the old proposition in a new way. One of the best known alternatives to Perry's solution to the puzzle is Lewis' (1979) self-ascription theory. Lewis proposes a revisionary solution that consists in taking belief to be a self-ascription of a property, for example, the property of being the one who is making a mess as opposed the property of being such that someone is making a mess. On this view, Perry does indeed come to believe something new when he finally figures out who is making a mess. Both theories leave something to be desired. Perry's doesn't preserve the intuition that Perry learns something new when he realizes that he is the one who is leaving the trail behind, and Lewis solves the problem only by making radical revisions to how we understand belief.

Soames proposes a different take on the problem that seems to avoid both of these drawbacks. According to him, Perry is performing different cognitive acts before and after the discovery. Before the discovery he is predicating the property of making a mess of the person who left the trail behind. After the discovery he is predicating the property of making a mess of himself. These are different cognitive acts resulting in instances of different propositions. Acts that result in instances of de se propositions place further requirements on the agent compared to acts that result in instances of de re and de dicto propositions. De se propositions are propositions that can only be entertained by an agent who thinks about them in the special first-person way. De se propositions, however, are representationally identical to de re propositions. Soames explains: 'Since these special ways of cognizing a predication target do not, for the reasons indicated above, involve any new predications of that target, the new propositions are representationally identical to ordinary de re propositions' (2013b, 34).

3. Two hidden assumptions

On Soames' view, a proposition receives its intentional properties from the cognitive operations (predicating, disjoining, conjoining, etc.) performed on its constituents by all the conceivable agents who perform these operations. Because it's a type of event rather than a token that is, or corresponds to, the proposition, individual differences in how the act is performed leave no marks on the proposition, except when the proposition is de se and hence can only be entertained by a single agent.

Soames makes clear that he treats the most basic cognitive operation, viz. that of predicating, as having similar logical properties as the relation of looking for. Graeme Forbes (2013) argues that search verbs like 'look for' are intensional transitives that are anomalous in that 'substituting one expression for another that is coreferential with it in the complement of the verb can change the truth-value of the sentence in which the VP occurs'. Lois Lane may be looking for Superman. But, Forbes argues, it does not follow that she is looking for Clark Kent, even though Superman is Clark Kent. By definition, necessarily co-extensional terms are co-substitutional in merely intensional contexts but not in hyperintensional contexts. So, on Forbes' treatment, search verbs are hyperintensional (Forbes

2003). According to Forbes, search verbs furthermore admit of 'a special "unspecific" reading if it contains a quantifier'. For example, Lois may be looking for an extraterrestrial, but no particular one. Finally, Forbes argues, 'the normal existential commitments of names and existential quantifiers in the complement are suspended'. Lois might be looking for the exit even if there isn't one. According to Forbes, there may or may not be different mechanisms underlying these three features.

Unlike Forbes, Soames appears to treat 'look for' as an intensional transitive that is not also hyperintensional and hence need not suspend existential commitment. He offers the following example:

> At this point, a word must be said about how I am using the verb 'predicate'. I begin here with the account previously given in *What is Meaning?* According to that account, the verb 'predicate' needed by the conception of propositions as cognitive-event types is analogous to the intensional transitive 'look for'. *If Bill is looking for Maria, and Maria is Mary, who, in turn, is the chief of police, then Bill is looking for Mary*, but it doesn't follow (on one reading) that he is looking for the chief of police [italics added] (2013b, 16).

Whereas co-extensional terms fail to be co-substitutional in both intensional and hyperintensional contexts, necessarily co-extensional terms are co-substitutional in intensional but not in hyperintensional contexts. As Soames holds that proper names are co-substitutional in intensional transitive 'look for' contexts, it follows that he treats names as necessarily co-extensional and 'look for' as an intensional but not a hyperintensional verb phrase. Necessarily co-extensional terms function the same way in extensional and merely intensional contexts. So, if 'look for' is merely intensional, as is entailed by Soames' view, then the normal existential commitments of proper names in the complement are not suspended.[1] The reason for this turns on the difference in the semantic values different operators operate on. Whereas extensional operators operate on referents, merely intensional operators operate on content. However, names that are necessarily co-extensional have their referents as their content. So, the normal existential commitments of proper names are not suspended when the operator is intensional but not hyperintensional.

Soames doesn't explain why he is treating 'predicating of' on the model of 'look for'. It might be because he wishes to preserve a relatively traditional semantic view of propositions, which leaves open the possibility of *modeling* propositions in terms of objects and properties. For example, the proposition that o is red can be modeled as the pair $< o, \text{redness} >$. Here I use the expression 'model propositions' in the standard sense, also used by Soames. To model a proposition is to use a formal construction to represent certain target properties of propositions. Models of propositions need not, and typically do not, tell us anything about properties not being modeled.

Soames further assumes a Millian notion of proper names, according to which the content of a proper name is its referent. It is this feature that makes proper names necessarily co-extensional and therefore co-substitutional in 'look for'

contexts, when the latter are treated as intensional but not hyperintensional. On the Millian view, proper names and their co-extensional descriptions turn out to have the same referents (or denotations) but different contents. For example, 'Superman' and 'the boring newspaper reporter who works at Daily Planet' have the same referents but different contents. The content of the former just is the referent, whereas the content of the latter is a descriptive complex.

These two assumptions, however, could be questioned. If propositions ultimately derive from the cognitive acts of agents, then the nature of the relation of predication probably is not something we can determine on a priori grounds. Rather, the nature of the cognitive acts of agents should determine what the logical properties of the predication relation are. Soames states that there probably isn't such a thing as 'bare predication' (Soames 2013c, 4). Rather, predicating is one of the acts agents perform when they engage in cognitive events like perceiving, believing, asserting, judging, etc. Judging and believing, for example, involve predicating and assenting, and perhaps other mental doings as well. It could very well be that when we look closer at these cognitive events, the act of predicating involved in these events does not have the logical properties that Soames assumes that it does. It could be that when we truly say that we believe that o is F, the act of predicating involved consists in an operation on the Kaplanian character of 'F' and the Kaplanian character of 'o'. Or more realistically: It could turn out that agents predicate properties of mental representations of things. For example, if I think that Soames is a philosopher, then it might be that my thought involves predicating *being a philosopher* of whatever is depicted in a mental image I happen to have of someone who looks like Soames. If these acts of predicating turned out to be integral elements of beliefs and thoughts that we express using proper names, then either 'predicating of' should not be treated on the model of 'look for' (as Soames appears to read it) or we should question the second assumption.

The second assumption, viz. that the content of proper names are their referents, plays a role in how we understand the act of predicating, even assuming the logical properties Soames attributes to the predication relation. According to Soames, one can think of an object o simply by possessing a name for it, without knowing much about its referent (Soames 2013b, 23). So, I can predicate wisdom of Socrates by possessing the name 'Socrates' and then performing a certain cognitive operation. Because 'predicating of' is treated on the model of 'look for', predication is an operation on content. As the content of a Millian proper name is its referent, predicating wisdom of Socrates is an operation on an object, given the logical properties Soames attributes to the relation. If, however, one were to deny the assumption that proper names are Millian, this wouldn't automatically follow. If proper names had descriptive content, then predicating wisdom of Socrates would be an operation on descriptive content, not objects.

There are, of course, good arguments in the literature for thinking that proper names are Millian proper names. But many of those presuppose that we have

already settled on what propositions are. Kripke's modal argument is familiar (Kripke 1980). Consider, for instance:

(5)
(a) Socrates is the teacher of Plato
(b) The teacher of Plato is the teacher of Plato

5(a) and 5(b) have different modal profiles: 5(a) expresses a proposition that is contingently true, whereas (5b) expresses a proposition that is necessarily true. Since 5(a) and 5(b) have different modal profiles, they have different contents. This shows that 'Socrates' and 'the teacher of Plato' cannot have the same content. Or so the argument goes.

This is a powerful argument, given a certain understanding of propositions as being both the bearers of modal properties and the entities expressed by utterances. Suppose, however, that it turns out that propositions are noncompositional assertoric contents, and that modal operators operate on compositional semantic values rather than assertoric contents (Stalnaker 1970, Lewis 1980, Salmon 1986, 1989; Dummett 1991, chap. 9; Stanley 1997a, 1997b; King 2003; Brogaard 2012, chap. 6). Then the modal profile of 5(a) and 5(b) that our intuitions track may well be a property of the compositional semantic values rather than a property of the assertoric content, in which case the modal argument is unsound. What this example is teaching us is that we cannot assume a particular theory of proper names prior to offering a theory of propositions. Given a cognitive theory of propositions, the nature of the content of proper names will turn out to depend on what the cognitive operations from which the intentionality of propositions derives are like.

Maintaining the two assumptions, in fact, does Soames a disservice. One of the advantages of his theory is that it solves certain semantic puzzles. But the solution to these puzzles is one-sided. It solves puzzles about beliefs that involve substituting a name for a description in a belief context. But it doesn't solve puzzles about belief that involve substituting one proper name for another. Consider:

(6)
(a) Lois Lane believes Superman can fly
(b) Lois Lane believes Clark Kent can fly

The puzzle here is to explain why 6(a) and 6(b) have different truth-values, if 'Superman' and 'Clark Kent' have the same content. The puzzle in 4(a)-(b) was solved because Mary might be able to predicate *being defended by Russell* of logicism without knowing that 'logicism' is a name for the proposition that arithmetic is reducible to logic. The two acts of predicating (i.e., predicating *being defended by Russell* of logicism and predicating that property of the view that arithmetic is reducible to logic) impose different constraints on the agent. Owing to these constraints, Mary might be able to perform one but not the other. But it is not clear that Soames can, or would want to, say something similar with

respect to 6(a)-(b). On Soames' view, the act of predicating involved in believing that Superman can fly is an operation that predicates *being able to fly* of Superman, an external object. But Superman is Clark Kent. So this very operation of predicating *being able to fly* of Superman, then, also is an act of predicating *being able to fly* of Clark Kent. Furthermore, if Lois Lane assents to the instance of the proposition that results from that cognitive act, then she assents to both the proposition that Superman can fly and the proposition that Clark Kent can fly. So, Soames' theory predicts that 6(a) and 6(b) have the same truth-values, which clashes with most people's intuitions. If Soames had not made the assumption that proper names are Millian, he might have used his theory to explain the difference in truth-value in this case as well.

Another semantic puzzle which Soames' theory only partially avoids is the puzzle of empty names. Soames can explain why an agent can perform the act of predicating wisdom of the King of France, despite the fact that the King of France does not exist. This can be done because 'predicating of' is an intensional (but not hyperintensional) transitive, according to Soames. As 'the King of France' is a description, and intensional transitives operate on content rather than referents, there is something there to predicate wisdom of, viz. the descriptive complex *the King of France*. But Soames' theory cannot explain the many instances of empty names that purport to function as genuine proper names. Soames' own example is that of predicating *being a planet* of Vulcan (e.g., involved in the thought accompanying Urbain Le Verrier's utterance 'Vulcan is a planet'). Soames argues that since Vulcan doesn't exist, the cognitive act of predicating *being a planet* of Vulcan cannot be performed or it is incomplete in some way. This seems rather unsatisfactory. An agent who doesn't know that Vulcan doesn't exists and who has a good deal of scientific information about it appears to undergo perfectly complete cognitive events involving Vulcan, including believing, judging, asserting, etc., all events involving the act of predicating. Here Soames' claim that the act of predicating *being a planet* of Vulcan cannot be performed or is incomplete is clearly driven by the prior assumption that proper names are Millian. A more natural thing to do in this case would be to note that agents do engage in these cognitive events involving things that do not exist and then infer from that either that predicating is not an operation of the kind assumed in Soames' work or that proper names are not Millian.

The two assumptions prevent a solution to a host of other semantic puzzles. Here I will look at two puzzles related to each other as well as to the puzzle of belief, viz. the problem of cognitive significance and the problem of the contingent a priori. Consider:

(7)
(a) Hesperus is Hesperus
(b) Hesperus is Phosphorus

The problem here is to explain why 7(b) appears to be more informative than 7(a) if they express the same proposition. 7(a) is a priori in the sense that once one

possesses the name 'Hesperus', it does not take any further engagement with one's environment to figure out that the proposition it expresses is true. But 7(b) is a posteriori in the sense that possessing the names 'Hesperus' and 'Phosporus' does not suffice for figuring out that it expresses a true proposition.

The related problem of the contingent a priori can be illustrated using the following example:

(8) Julius invented the zip (if someone did)

If 'Julius' is a genuine proper name introduced via the description 'the inventor of the zip', then (8) is a priori. If, on the other hand, the 'Julius' is acquired in a standard causal-historical way, then (8) is a posteriori. However, on most traditional views of propositions, (8) expresses the same proposition regardless of how the name is acquired. The problem is to explain how we can stand in different epistemic relations to one and the same proposition.

Given the assumptions Soames makes, it is not clear how the cognitive theory of propositions could solve these puzzles. In the first case, the act of predicating *being Hesperus* of Hesperus is the same act as that of predicating *being Phosporus* of Hesperus, because 'Hesperus' and 'Phosphorus' are proper names (or at least we can treat them as such), and when proper names are involved, the act of predicating predicates properties of objects. In the second case, things are similar. If 'Julius' is a genuine proper name, then there is only one act of predicating that produces an instance of the proposition that Julius invented the zip. So, it remains to be seen how we can stand in different epistemic relations to the act. If Soames' theory does offer an explanation of the epistemic differences in the two cases, he hasn't yet shown us what it is.

It should be emphasized that the problems with Soames' proposal that I have presented in this section are largely due to the reading Soames appears to attribute to 'look for' and hence to 'predicating of'. If Soames were to adopt Forbes' reading of 'look for' for the case of 'predicating of', my objections would be moot. Forbes' reading requires a semantics of the kind I am outlining at the end of the paper. So, the semantic proposal at the end can be understood as treating 'predicating of' as a hyperintensional transitive.

4. Traditional semantics and empirical evidence

Although I disagree about the details of Soames' new proposal, I agree that propositions derive their intentionality from agents who are engaged in representing things to be a certain way by performing cognitive operations like that of predicating. I also agree that propositions derive their intentionality from agents because they are (or are the result of) act types of predicating. However, I don't think that we can, or should, say much about the nature of the act of predicating prior to empirical investigation. If, indeed, propositions derive their intentionality from agents, then the common nature of cognitive operations and what they operate on ought to be determined empirically in cross-disciplinary

work in, for example, perception, cognition, language production and language comprehension.

The main type of evidence for linguistic theories in philosophy of language and theoretical linguistics has traditionally consisted in two types of intuitions. Primary intuitions are introspective judgments about the acceptability or plausibility of a given linguistic expression, discourse fragment or inference. Secondary intuitions are introspective judgments explicitly about what a given linguistic expression refers to, what an utterance expresses or whether an inference is valid, or why the language works in those ways. Secondary intuitions are also sometimes called 'metalinguistic', because they are judgments explicitly about grammaticality, meaning and reference (Martî 2009). Primary intuitions, when collected carefully and systematically, constitute a much more robust kind of evidence for linguistic theories than secondary intuitions (Wasow and Arnold 2005). This is because unlike secondary intuitions, primary intuitions reflect how speakers use, or would use, an expression, and actual and potential language use fully determines meaning and reference. Of course, even when primary intuitions are collected carefully and systematically, they should not be considered a kind of irrefutable evidence, especially since even primary intuitions can vary considerably across speakers, perhaps partially because even this type of intuition can be difficult to access introspectively. However, in core cases at least we can hope to find some convergence in the primary judgments of speakers. Primary intuitions, of course, should not ultimately be the only kind of evidence for our theories. This type of evidence must eventually be supplemented by evidence from the cognitive sciences, which have used a range of different paradigms for testing cognitively-based semantic hypotheses, including reaction-time experiments, sentence completion tasks, eye-tracking, and neuroimaging. It is important to note, however, that the other types of evidence often incorporate reports of participants' primary intuitions (see e.g. Woodbury 2011).

In philosophy of language secondary intuitions have often been given more credit than primary intuitions. Secondary intuitions are typically used in verdicts about cases. The verdicts that are required in Kripke's Gödel case, for example, are not about the acceptability of sentences or inferences but about which person the name 'Gödel' refers to in a hypothetical scenario. Philosophers of language typically rely on their own secondary intuitions about this or similar cases to support their theories. It is also primarily philosophers' reliance on secondary intuitions that has been criticized by experimental philosophers (see e.g., Machery et al. 2004). Sometimes primary intuitions are explicitly set aside or ignored in order to give credit to secondary intuitions. A good example of this is the case of belief contexts. A lot of effort has gone into explaining why substituting one proper name for another in belief contexts seems unacceptable to many lay speakers when traditional semantics predicts that it should be valid. Primary intuitions have thus been set aside in favor of secondary intuitions in an effort to preserve the basics of traditional semantics. It is not difficult to see how philosophers taught to cherish a neo-Russellian account of propositions, which

combines the Russellian account with a Millian theory of proper names, might be tempted to rely on this kind of methodology.

The cognitive theory has a major advantage compared to the neo-Russellian theory in this regard. The neo-Russellian theory of propositions has the answer to questions of reference and meaning built into it. The cognitive theory by its very nature demands empirical investigation as the only plausible way to settle questions about meaning and reference. If necessary, it could even accommodate significant inter- and intra-cultural differences in the cognitive acts of agents by sorting cognitive acts into cognitive subtypes.

If standard semantics is not empirically valid (or at least has not been shown to be), then the question arises what might take its place? We don't know yet. But if we look at the primary intuitions about the validity of inferences in ordinary language, the semantics that must accompany a cognitive theory of propositions will in all likelihood be radically different from the traditional framework. Though I hesitate to make any firm conclusions about what a correct semantics involving cognitive act types will look like once we look at a broader range of evidence, I will attempt to offer a semantic model of cognitive act types in the next section, relying on primary intuitions about cases.

5. A semantics for cognitive propositions

If we want to preserve the primary intuitions about cases outlined in the previous sections, it is clear that none of the standard ways of modeling propositions, or cognitive act types, is going to work. Consider first the suggestion that propositions can be modeled as intensions. The intension of an expression can be thought of as a function from worlds to extensions; it assigns, at each world, an extension to the expression. 'p' and 'q' express the same proposition iff they share a truth-value at every world. At first glance, this suggestion may seem to be ruled out by Soames' theory, as he states that possible world states conceptually depend on truth, propositions, and our ordinary modal notions (Soames 2013c). However, we can do without worlds altogether and construe intensions in terms of admissible extension-assignments, or interpretations. Typically, admissible extensions-assignments (for all the expressions) are precisely those that

(i) respect the classical valuation (truth) conditions for the logical constants and operators ($\sim$, &, $\forall$, $=$, $\Box$, etc.), and
(ii) agree with the actual extensions of every name.

Let's call these the *normal* interpretations (or normal extension-assignments).

The intension of an expression, then, is a function from normal interpretations to extensions. The intension of a given name is, by convention, a constant function from normal interpretations to the same individual. The intension of a predicate is a function from normal interpretations to sets of individuals. The intension of a whole sentence is a function from normal interpretations to

truth-values. ‘p’ and ‘q’ express the same proposition iff they are assigned the same truth-values at every normal interpretation.

But intensions, of course, are not fine-grained enough to preserve even basic intuitions. If an agent A predicates evenness of the number 16, and another agent B predicates humanity of Socrates, they perform instances of very different act types of predicating. But if propositions are modeled on intensions, then there is only one necessary proposition and only one impossible proposition. So, this model wrongly predicts that A and B are performing instances of the same cognitive act type. Propositions modeled as intensions also lead to an inverted relations collapse and a collapse of certain contingent logically equivalent claims. For example, ‘a is taller than b’ and ‘b is shorter than a’ are strictly equivalent, as are ‘p’ and ‘p & (q v ~ q)’.

Another traditional proposal is to model propositions as structured intensions. There are several ways to do this. One natural proposal is to define a notion of a structured extension for sentences. Structured extensions are based on extensions. Different types of expressions have different types of extensions, as illustrated below:[2]

Expressions	Their Extensions
Names, type e	individuals
Predicates, type < e,t >	sets of individuals
Sentences, type t	truth values

Instead of taking the extension of a sentence to be a truth-value, we can take extensions of sentences to be composed of the extensions of the sentence’s parts. Let the structured extension of a sentence be the n-tuple that represents the set of extension-assignments to the sentence parts that are ordinarily assigned extensions. The following specifies the structured extensions for three types of sentences:[3]

Sentence	Sentence Structure	Structured Extension
‘Al sits’	< a, S_, Sa >	< Al, set of sitters, true >
‘2 equals 2’:	< a, a, a = a >	<2, 2, true >
‘p implies p’:	< p, p, p → p >	< false, false, true >

The structured intension of a sentence is a function from (normal) interpretations to structured extensions. Given this notion of a structured intension, we can say that two sentences, ‘p’ and ‘q’, express the same proposition iff they share a structured intension. This is equivalent to saying that ‘p’ and ‘q’ express the same proposition iff ‘p’ and ‘q’ share a structured extension on every (normal) interpretation.

This proposal avoids the problem outlined above. Since ‘2 = 2’ and ‘snow is white → snow is white’ are necessarily co-extensional, they express the same

unstructured intension. But because they do not have the same isomorphic structures, they express different structured intensions. So it will not generally be the case that strictly equivalent sentences express the same proposition.

However, this proposal cannot deal with the problems of cognitive significance and the contingent a priori. Consider again:

(7)
(a) Hesperus is Hesperus
(b) Hesperus is Phosphorus

The problem was this. Intuitively, 7(a) is less informative than 7(b); it's not just that an ordinary agent could believe the former without believing the latter, but there is also a sense in which the latter expresses something that is richer than the former.

Modeling act types as structured intensions cannot accommodate this intuition. As 7(a) and 7(b) have the same grammatical structure, *normal* interpretations assign the same extensions to the sentence's parts. Furthermore, *normal* interpretations always assign the same individuals to 'Hesperus' and 'Phosphorus'. So, 7(a) and 7(b) express the same proposition (qua structured intension), not a satisfactory result. Not only does believing one imply believing the other, but we also haven't uncovered a sense in which 7(b) is *more informative* than 7(a).

The related problem of the contingent a priori can be summarized as follows. Consider the following sentence, repeated from above.

(8) Julius invented the zip (if someone did)

If 'Julius' is introduced via the description 'the inventor of the zip', (8) is a priori. If, on the other hand, the name is acquired in a standard causal-historical way, then (8) is a posteriori. However, in each case, (8) has the same structured intension. So, this semantic framework has nothing to say about how to explain the epistemic difference between the two cases.

A further problem is provided by hyperintensional contexts. Some hyperintensional sentences 'O[p]' are special in that they can be true, even though there is no normal interpretation that makes 'p' true. Not all hyperintensional expressions work in this way. For example, 'Lois Lane believes Superman can fly' is hyperintensional but there is an actual normal interpretation that makes 'Superman can fly' true (within the story). But there is no normal interpretation that makes the following embedded sentences true.

(9)
(a) John entertained the possibility that $\sim(p \rightarrow p)$.
(b) John wanted it to be the case that $a \neq a$.
(c) John said that $a \neq a$.
(d) According to fiction F, $a \neq a$.

(e) It's not the case that (if *a* had failed to be identical to *a*, then 'a = a' would have been true). [where the context is ' $\sim (\Box \rightarrow q)$'.]

It is not clear how any framework in terms of logically possible worlds or *normal* interpretations can provide a framework for explaining these contexts. The only option that seems to be left as a semantic model that captures our primary intuitions about cases is one that introduces the notion of a structured hyperintension. The hyperintension of an expression can be thought of as a function from possible and impossible worlds to extensions (Brogaard and Salerno 2013). Without invoking worlds-talk, the hyperintension of an expression can be thought of as assigning an extension from each normal or non-normal interpretation. For example, the hyperintension of 'Hesperus' maps the normal interpretations to Venus, but it may map the non-normal interpretations to some other object, and the hyperintension of 'Hesperus is Hesperus' maps normal interpretations to True, but may map non-normal interpretations to False (even if the non-normal interpretation assigns Venus to 'Hesperus'). An interpretation is non-normal either by (i) failing to respect the valuation conditions for the logical constants, or (ii) failing to agree with the normal interpretations on the extension of some name.

The logical constants and operators that occur in a sentence are defined only for normal interpretations by convention. So, they always get assigned a normal extension even on non-normal interpretations. Hyperintentional models for non-indexical sentences of the language will be n-tuples, $M = \langle D, I, R \rangle$, consisting of a domain, a set of normal and non-normal interpretations and a binary relation on I, outlined as follows:

D = a domain of actual objects (to serve as normal and non-normal extensions)
I = a set of normal and non-normal interpretations assigning extensions to all the expressions (names, predicates and whole sentences). One interpretation, $i^{@}$, is the distinguished interpretation, and can be thought of as the actual assignment of extensions to the expressions. The normal interpretations, i, respect the valuation conditions (are compositional) and agree with $i^{@}$ on the extensions of all the names. The non-normal interpretations either violate the valuation conditions or disagree with $i^{@}$ on the extension of some name.
R = a binary relation on I. Specifically, it characterizes which normal and non-normal interpretations are admissible relative to a given normal interpretation

To deal with the indexicality involved in de se propositions we'll need further resources. Let interpretations be assignments at a centered point, viz. a world w, a time t, an individual i and a demonstration of an object d. A normal interpretation then assigns the individual i at the distinguished point to 'I', the time t at the distinguished point to 'now', the location of i at the distinguished point to 'here' and the object demonstrated at the distinguished point to 'this' and 'that'. A non-normal interpretation may assign arbitrary extensions to indexicals and

demonstratives. This explains why it is possible for me to believe that I am not Brit. Some of my belief-worlds are non-normal interpretations. They assign Brit to 'Brit' but someone other than Brit to 'I'.

The valuation conditions for any 'universal' (hyper)intensional operator h can be given as follows.

$\Box^h$, $\Box^h F\phi$ is true just in case at every h-admissible interpretation i, i assigns True to ϕ.

Here are some examples:

(10)
(a) 'It is metaphysically necessary that ϕ' is true iff at every normal interpretation i, i assigns True to ϕ.
(b) 'It is a priori that ϕ' is true iff at every ideally conceivable interpretation i, i assigns True to ϕ.
(c) 'It is believed that ϕ' is true iff i assigns True to ϕ at every doxastically admissible interpretation i.

An example of an ideally conceivable interpretation that is not normal is the assignment of XYZ to 'water'. Every normal interpretation assigns H_2O to 'water' but empirical discoveries aside it is epistemically possible that 'water' is XYZ. Likewise, if all I know and believe about Violette Szabo is that she is a famous female spy and I don't have any spy-beliefs about Michelle or Barack Obama, then a non-normal but doxastically admissible interpretation with respect to my belief set is one that assigns Michelle Obama as an extension to 'Violette Szabo'. An assignment of Barack Obama to 'Violette Szabo', however, is inadmissible.

As noted above, the logical constants and operations are only defined for normal interpretations by linguistic convention, and therefore always get assigned a normal extension. So, 'every S is P entails that some S is P' is false on all interpretations. But consider now the following sentence:

(11) Bert believes that *every S is P* entails that *some S is P*

If the embedded sentence is false on all interpretations, how do we account for the potential truth of (11)? Here is how. (11) can be true, because there is a non-normal, doxastically permissible interpretation that assigns the truth-value True to *every S is P entails that some S is P*, regardless of which truth-values are assigned to *every S is P* and *some S is P*. If Bert irrationally believes that every S is P, disbelieves that some S is P and believes that *every S is P* entails *some S is P*, then the only doxastically permissible interpretations are those that assign True to *every S is P*, False to *some S is P*, and True to *every S is P entails that some S is P*.

On the hyperintensional semantics outlined here, 'p' and 'q' express the same cognitive act type (proposition) if and only if they are assigned the same structured extension on every normal and non-normal interpretation. For example, 'The article was written by Russell' and 'Russell wrote the article' are assigned the same structured extension on every normal and non-normal

interpretation. Since not all strictly equivalent sentences express the same hyperintension, it should be clear that propositions are sufficiently fine-grained to do at least as well as structured intensions with respect to the problem of necessarily equivalent sentences.

But the proposed semantics is also equipped to deal with the problems of cognitive significance and the contingent a priori. 7(a) 'Hesperus is Hesperus' and 7(b) 'Hesperus is Phosphorus' express different structured hyperintensions, because all interpretations assign the same object to the two occurrences of 'Hesperus' in 7(a) but some of the non-normal interpretations assign different objects to the occurrences of 'Hesperus' and 'Phosphorus' in 7(b). This is why it is possible for someone to believe 7(a) but not 7(b). Moreover, 7(b) expresses something more informative than 7(a) in the sense that there are more distinct non-normal ways to interpret 7(b) and its components. Consequently, learning 7 (b) 'rules out' more interpretations.

As an example of a contingent a priori sentence consider again:

(8) Julius invented the zip (if someone did)

If 'Julius' is a proper name, then (8) expresses the same structured hyperintension regardless of how the referent of 'Julius' is fixed. The proposition, however, may vary its epistemic status across contexts. If 'Julius' is stipulated to name the inventor of the zip (if there is one), then (8) is a priori. In the other case, it is a posteriori. The reason for this has to do with the nature of the epistemic modal operators. Certain non-normal interpretations of 'p' and its parts are ruled out when it is a priori that p. Interpretations that yield False for (8) are not a priori-admissible (ideally conceivable). For example, an assignment of Julius to 'Julius' and Scott Soames to 'invented the zip' is inadmissible. This is not so in the a posteriori case.

The model of proposition in terms of hyperintensions also provides a way to deal with hyperintensional contexts. Consider:

(12)
(a) John felt that $\sim(p \rightarrow p)$
(b) According to fiction F, $a \neq a$.

In 12(a), the John-felt-that-admissible interpretations include, say, an interpretation of 'p' as True and '$p \rightarrow p$' as False. In 12(b) the Fiction-F-admissible interpretations might include the non-normal assignment of the number 1 to 'a' and False to '$a = a$'.

Finally, the present semantic framework allows that sentences containing proper names that refer to things that do not exist can express complete propositions. Consider:

(13) Vulcan is a planet

If propositions are structured hyperintensions, then there is no assumption to the effect that the only admissible extension-assignments are the actual referent

of the name. While normal extension-assignments will be undefined, non-normal extension-assignments will assign existing entities to 'Vulcan'. So, the sentence will express a proposition that is a function from non-normal extension-assignments to extensions. This proposition, of course, is false.

A problem reminiscent of the original problem of empty names remains. Any sentence that results from substituting an "empty proper name" for Vulcan will express the same proposition, which may seem unintuitive. However, this is only a real problem for semantic frameworks that do not have a way of offering an adequate account of belief contexts. Consider:

(14)
(a) Urbain Le Verrier believes that Vulcan is a planet
(b) Scott Soames believes that Vulcan is a planet

Whereas traditional semantics predicts that 14(a)-(b) have the same truth-value (false), the present semantics predicts that they have different truth-values. As Urbain Le Verrier engaged in cognitive acts of believing that predicated *being a planet* of Vulcan, the only admissible (non-normal) assignments to 'Vulcan' are planets. So, 14(a) comes out true. As Soames has no belief involving Vulcan, there are no admissible assignments of an extension to 'Vulcan'.[4] So, 14(b) and its negation are false.

This semantics for cognitive act types (propositions) yields extremely fine-grained act types. For example, it predicts that the act of predicating *being Phosporus* of Hesperus and the act of predicating *being Hesperus* of Hesperus are different types of acts of predicating. But this is just the result we want. While some agents who perform these acts of predicating know that Hesperus is identical to Phosphorus, others do not. The act *types* abstract away from these individual differences and preserve only what the acts performed by actual and conceivable agents have in common, which means that we abstract away from the fact that some agents know that Hesperus is Phosporus. So, at the abstract level of the *type* the two acts of predicating are distinct types of acts.

The feeling that we might have that the semantics makes act types too fine-grained further diminishes once we consider sentences embedded in hyperintensional contexts. Consider:

(15) Scott Soames believes Hesperus is Phosphorus

'Hesperus is Phosphorus' expresses an extremely fine-grained act type that encompasses the tokens of all conceivable agents. But once this sentence is embedded under 'Scott Soames believes' its admissible interpretations are narrowed down by Soames' belief set. Since Soames knows (and hence believes) that Hesperus is Phosporus, there is no admissible interpretation that assigns different extensions to 'Hesperus' and 'Phosphorus'. So, this particular belief context is not hyperintensional. This is another virtue of the semantics: It predicts that cognitive event types relativized to different individuals, such as *Soames-believings* and *Wedgwood-believings*, can come apart.

6. Conclusion

On Soames' new cognitive theory of propositions, the intentionality of propositions is derived from the intentionality of agents. It's agents who most fundamentally represent things as being a certain way. When agents represent, their acts of predicating (or cognizing) thereby become representational, and it's the intentionality of the act of predicating (e.g., predicating redness of o) and other mental operations that explain the intentionality of the event token and event types (e.g., seeing that o is red). Propositions just are the act type of predicating together with other types of cognitive operations, such as conjoining, disjoining, negating, etc. Even though propositions are ultimately derived from the mental doings of agents, Soames' framework may seem to allow us to *model* propositions in the standard way as n-tuples of objects and properties. I have argued, however, that Soames gets this result only by illicitly assuming (i) that the relation of predicating is an intensional but not a hyperintensional transitive and (ii) that proper names are Milliam. Both claims are unargued for and seem to presuppose a particular conception of propositions as n-tuples of objects and properties. But this presupposition is not valid, given a cognitive theory of propositions. I then briefly examined what can count as evidence for the nature of the constituents of the cognitive operation types that produce propositions and argued that the common nature of cognitive operations and what they operate on ought to be determined empirically in cross-disciplinary work in perception, cognition, language production and language comprehension. I concluded by offering a semantics for cognitive act types that accommodates one type of empirical evidence.[5]

Notes

1. It seems that Forbes would largely agree that if co-substitution of necessarily co-extensional terms is permissible, then we do not get the unspecific reading, and the existential commitments are normal. According to him, search verbs (e.g., 'look for'), depiction verbs (e.g., 'draw') and desire verbs are anomalous in all three ways. Evaluative verbs (e.g., 'admire') and emotion verbs (e.g., 'fear') are anomalous in the first and third way but do not typically have an unspecific reading. 'Need' as well as transaction verbs (e.g., 'owe') are atypical in that they allow for certain types of substitution but not others.
2. This, of course, could be extended to other types of expressions. For example, quantifier expressions can be treated as second-order predicates, or type $\ll e, t>, \ll e, t>, t\gg$, denoting relations between sets of individuals.
3. The extension of the whole sentence is taken to be a constituent of the structured extension. This move is redundant for structured intensions but will become important when we look at structured hyperintensions.
4. Of course, it could also be the case that Soames' belief set includes a belief that involves a descriptive name 'Vulcan' that is equivalent to something like 'the planet Urbain Le Verrier thought existed on the basis of peculiarities of Mercury's orbit'. In that case he might hold a belief to the effect that Vulcan doesn't exist.
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