Control in Centered Worlds[*]

Tamina Stephenson
Yale University

This paper extends the framework of Lasersohn (2005) to give an updated semantic approach to control. On the view proposed here, all clausal constituents express (have as their semantic intensions) sets of centered worlds. In control constructions, the subject of the lower clause ("PRO") is identified with the "center" of a centered world. This view allows for a uniform semantic analysis of clauses, including those with and without null subjects, and for propositional attitude predicates.

1. Introduction

I begin with a parallel involving ellipsis. First, consider the sentence in (1), focusing on how the predicate *fun* is interpreted.

(1)   Sam thinks that rollercoasters are fun, and Sue does too.

The first conjunct of (1), *Sam thinks that rollercoasters are fun*, conveys something like the following: (i) Sam enjoys the experience of being on a rollercoaster – that is, rollercoasters are fun for Sam, and (ii) Sam himself is aware of this fact. The second conjunct, *Sue does too* says, of course, that the same thing is true for Sue. Crucially, though, this only has a "sloppy identity" (or "bound") interpretation: *Sue does too* says that (i) rollercoasters are fun for Sue, and (ii) Sue is aware of this fact. (1) would not be true, for example, in a situation where both Sam and Sue were aware that rollercoasters were fun for Sam, but where Sue was also aware that rollercoasters were not fun for her.

   This mirrors a similar well-known fact about ellipsis in control constructions as in (2).[1]

(2)   Sam wants to be famous, and Sue does too.

Here *Sue does too* means that Sue wants (herself) to be famous, not that Sue wants Sam to be famous. Again, the ellipsis in (2) allows only a "sloppy" reading and not a "strict" reading.

   In this paper, I will suggest that this is only one instance of a more general set of parallels, which arise from a close semantic connection between the experiencer of taste predicates such as *fun* and the implicit subject of embedded clauses in control constructions. In particular, I will propose here that both of these items refer to the individual "center" of a centered world (treated as a world-individual pair), within a system where sentences in general express sets of centered worlds.

[1] It is unclear where the credit should go for this observation, but it seems to go back, in various forms, at least to Morgan (1970).

The rest of the paper is organized as follows: In Section 2, I set the stage by reviewing the phenomenon of *de se* attitudes and Chierchia's (1989) property-based view of control. In Section 3, I go through the centered worlds approach to the semantics of taste predicates developed in various forms by Lasersohn, myself, and others. In Section 4, I give the central proposal of this paper, which is to extend the centered worlds approach to control constructions. I show how this captures key properties of control, including locality phenomena and *de se* interpretation. Section 5 then compares my proposal with a pure property-based view like Chierchia's and with a shifting indexical view of the kind suggested by Anand & Nevins (2004). Sections 6 and 7 contain remaining problems and conclusions.

2. *De Se* Attitudes and Centered Worlds

I will begin by reviewing previous observations about the obligatory *de se* interpretation of control constructions, which was a key motivation for Chierchia's property-based analysis (Chierchia, 1989).

2.1. The *De Se* Interpretation of Control Constructions

It is well known that controlled PRO must be interpreted *de se* in the sense of Lewis (1979) – that is, the attitudes expressed crucially involve the attitude holder's access to their own "self." (See, e.g., Morgan, 1970; Chierchia, 1989). Consider (3), for example.

(3)   Pavarotti wants to be famous.   (based on examples by Chierchia, 1989)

The observation is that if Pavarotti thinks to himself, "I want to be famous," then this can be reported as (3). If, on the other hand, Pavarotti hears a recording of a talented singer on the radio, not realizing that it is a recording of his own voice, and thinks to himself, "I want the man on the radio to become famous," this cannot be reported by (3).

Similar facts hold for the Italian verb *credere*, 'believe' when it appears with an infinitival complement, as in (4). For example, if Pavarotti thinks to himself, "I am a genius," his belief can be reported as (4); but if he unwittingly hears himself on the radio and thinks, "That man on the radio is a genius," his belief cannot be reported this way.

(4)   Pavarotti crede   di   essere un genio.
            Pavarotti believes COMP be   a   genius
            'Pavarotti believes that he's a genius.'
            [Lit.: "Pavarotti believes to be a genius"]

                                          (Anand, 2006, no. (1a); based on Chierchia, 1989)

De se attitudes were discussed earlier in a philosophical context by, e.g., Castañeda (1966, 1968), Perry (1977, 1979), and Lewis (1979). A general approach to propositional attitudes that has come out of this work uses centered worlds. On the simplest formulation, these are just world-individual pairs $<w, x>$, which can be thought of as a world w experienced from the point of view of an individual x. We can then speak of a person x's doxastic (belief) alternatives, for example, as those centered worlds of which x might be the center (as far as x's beliefs are concerned). This definition is repeated more precisely in (5). Parallel definitions can be given for other attitudes, such as 'want' alternatives in (6).

(5)   Doxastic Alternatives:
            $Dox_{w,x} = \{<w', y> : $ it is compatible with what x believes in w that x (x's self) is y in w'$\}$

(6)   'Want' Alternatives:
            $Want_{w,x} = \{<w', y> : $ it is compatible with what x wants in w for x (x's self) to be y in w'$\}$

Essentially, a person's 'want' alternatives are those world-individual pairs $<w', y>$ such that their wants would be satisfied if they themselves were y in w'.

2.2. The Property View of Control

Chierchia (1989) gives a proposal for control that is designed to capture the obligatory *de se* interpretation of sentences like (3)-(4). His proposal has two main components: first, giving control predicates meanings involving (sets of) centered worlds, and second, giving embedded clauses in control constructions the semantic type of a property. First, then, attitude predicates that participate in control constructions are given meanings (in addition to their normal non-control ones) that involve notions like doxastic or "want" alternatives as in (5)-(6). For example, English *want* and Italian *credere*, 'believe' are given lexical meanings along the lines of (7)-(8).

(7) $[\![credere\ (\text{'believe'})]\!]^w = [\lambda P_{<s,\ et>} . [\lambda z_e . \forall <w', y> \in Dox_{w,z}: P(w')(y) = 1]\ ]$

(8) $[\![want]\!]^w = [\lambda P_{<s,\ et>} . [\lambda z_e. \forall <w', y> \in Want_{w,z}: P(w')(y) = 1]\ ]$

According to (7), *z crede P* ('z believes P') is true iff all of z's doxastic alternatives $<w', y>$ are such that y has property P in w'. According to (8), *z wants P* is true iff in all of z's 'want' alternatives $<w', y>$, y has the property P in w'.

The second part of the account is to get infinitive clauses to have a property-type meaning. To achieve this, Chierchia assumes that PRO has the type of an individual (e), but is obligatorily bound by an abstraction operator. I won't go into the compositional details of the abstraction operator here, except to say that in the cases that will be relevant here, it has the effect that an expression with syntactic structure of the form in (9a) will have the denotation in (9b).[2]

(9) (a) $Op_1\ [PRO_1\ [\alpha]\ ]$

     (b) $[\![\ Op_1\ [PRO_1\ [\alpha]\ ]\ ]\!]^w = [\![\alpha]\!]^w$

This means, for example, that the infinitive *to be a genius* has the structure in (10a) and the property-type meaning in (10b).

(10) (a) $Op_1\ [PRO_1\ [\text{to be a genius}]\ ]$

      (b) $[\![\text{to be a genius}]\!]^w = [\lambda y . y\ \text{is a genius in w}]$

For example, then, (3), *Pavarotti wants to be famous*, is predicted to have the truth conditions in (11).

---

[2] This will be the case provided that α does not contain a free variable with index 1. (Thanks to managing editor Philippe Schlenker for reminding me of this.)

(11) $[\![(3)]\!]^w = [\![$ Pavarotti wants [Op$_1$ [PRO$_1$ [to be famous]]] $]\!]^w$

$= [\![$want$]\!]^w$ ([$\lambda w'$. [$[\![$ Op$_1$ [PRO$_1$ to be famous] $]\!]^{w'}$) (Pavarotti)

$= [\![$want$]\!]^w$ ([$\lambda w'$. [λx . x is famous in w']]) (Pavarotti)

$= 1$ iff $\forall <w', y> \in$ Want$_{w,\text{Pavarotti}}$: y is famous in w'

This says that *Pavarotti wants to be famous* is true iff in all world-individual pairs $<w', y>$ such that it's compatible with what Pavarotti wants for him to be y in w', y is famous in w'. This is the correct meaning, and captures the *de se* interpretation of the attitude.

It should be noted here that I am recasting Chierchia's analysis in a system where the basic type of sentences is t, and they combine with attitude predicates by a rule of Intensional Functional Application. In extensional contexts, the simpler composition rule of Functional Application is used. (See, for example, von Fintel & Heim, 2009.) Since I will be positing modifications of these rules later on, I have included definitions in (12)-(13).

(12)   **Functional Application (FA)**: If α is a complex expression formed by combining two expressions β and γ, and $[\![\gamma]\!]^w$ is in the domain of $[\![\beta]\!]^w$, then $[\![\alpha]\!]^w = [\![\beta]\!]^w$ $([\![\gamma]\!]^w)$.

(13)   **Intensional Functional Application (IFA)**: If α is a complex expression formed by combining two expressions β and γ, and $[\lambda w'_s \ . \ [\![\gamma]\!]^{w'}]$ is in the domain of $[\![\beta]\!]^w$, then $[\![\alpha]\!]^w = [\![\beta]\!]^w$ ($[\lambda w'_s \ . \ [\![\gamma]\!]^{w'}]$).

In this kind of system, attitude control predicates such as *want* and *credere*, 'think' have to be ambiguous between a property-taking meaning as in (7)-(8), used in control constructions, and a standard proposition-taking meaning to be used in non-control constructions. The second, proposition-taking meaning, would be along the lines of (14)-(15).

(14) $[\![$think$]\!]^w = [\![$credere ('believe')$]\!]^w = [\lambda p_{<s,\,t>} \ . \ [\lambda z_e \ . \ \forall <w', y> \in$ Dox$_{w,z}$: $p(w') = 1]]$

(15) $[\![$want$]\!]^w = [\lambda p_{<s,\,t>} \ . \ [\lambda z_e \ . \ \forall <w', y> \in$ Want$_{w,z}$: $p(w') = 1]$]

Note that these meanings still make reference to doxastic alternatives and 'want' alternatives that use centered worlds, but the world center here is an idle wheel. For example, using the meaning in (14), the sentence *Sam thinks that it's raining in New Haven* is true iff for all of the centered worlds $<w', y>$ compatible with Sam's beliefs, it's raining in New Haven in w'. Similarly, the sentence *Sam wants it to rain in New Haven* is true iff in all the centered worlds $<w', y>$ compatible with Sam's desires, it's raining in New Haven in w'.

2.3. Comment on Semantic Types

On the view just described, control verbs require an argument of type $<s, et>$. The complement clauses (where PRO is bound by an individual binder) have semantic type $<e, t>$, and an extra world argument is in effect added by the compositional rule. Note, though, that $<s, et>$ is also the type for a set of centered worlds (modulo currying). As far as the types are concerned, then, we could achieve the same effect if the embedded clause were type t (the basic type of a sentence), and the compositional rule added an extra centered-world argument. This kind of system has in fact been proposed in a different domain, in particular for sentences containing taste predicates such as *tasty* and *fun* (e.g., Lasersohn, 2005; Stephenson, 2007). I will propose in Section 4

below that this system be extended to control constructions, but first I need to give some background on taste predicates.

3. <u>Taste Predicates and Centered Worlds</u>

Let me begin with some background on the semantics of taste predicates.

3.1. Two Uses of Taste Predicates

The first thing to know about taste predicates is that (I claim) they have two distinct uses. First, they have a use where they seem to actually take an experiencer argument. This possibility comes out especially clearly in contexts where there is an obviously relevant experiencer who cannot plausibly be a participant in the conversation, and where it's unlikely for the participants in the conversation to have experienced the relevant thing – for example, a situation where people are talking about whether some kind of cat food tastes good to their cat.

This experiencer argument can be implicit as in (16a) (based on examples by Lasersohn, 2005). It can also be explicit, as in (16b). Of course, if the experiencer argument is implicit, it must refer to an individual that is sufficiently salient in the context.

(16)   [Context: Sam is watching his cat, Princess, eat cat food. Princess is gobbling it enthusiastically. Sam says:]

    (a)   Oh good, the new cat food is tasty.

    (b)   Oh good, the new cat food tastes good to Princess.

In this context the perspective of the cat is particularly salient, and *tasty* in (16a) seems to be understood as "tastes good to Princess." For the most part I will be ignoring this use of taste predicates here, but it is important to keep in mind that I am assuming it is a separate use.

Crucially, taste predicates have a second use in which they seem to be doing something more complicated, and this is the use which I will primarily deal with here. Consider the dialogue in (17).

(17)   Mary: How's the cake?
             Sam: It's tasty.
             Sue: No it isn't!

On the most natural interpretation of (17), Sam is (in some sense) expressing or reacting to the fact that the cake tastes good to him, and Sue is (in some similar sense) expressing or reacting to the fact that the cake does not taste good to her. The crucial point about this use of *tasty* (and parallel cases with other taste predicates) is that it cannot be treated simply as containing a contextually salient argument.[3] This has been argued in some detail elsewhere, and I will only give a brief summary of the key points here. Essentially, the two most tempting approaches along these lines would be to say that (i) taste predicates such as *tasty* in (17) contain implicit speaker indexicals, or (ii) they contain implicit generic pronouns. Let me briefly explain why neither of these approaches will work. For more detailed arguments, see, for example, Lasersohn (2005) and Stephenson (2007).

---

[3] More sophisticated "contextualist" approaches have of course been proposed, for example by Stojanovic (2007) and von Fintel & Gillies (2008). Arguing against those views is beyond the scope of this paper.

First let's consider the "speaker indexical" option. Note that in (17), Sam and Sue both seem to be expressing something about their own experience. Thus one might be tempted to think that the experiencer is simply the speaker in each case – in other words, that *tasty* used in this way simply means 'tastes good to me' (i.e., to the speaker). But consider what happens if the experiencer is explicitly marked with a first-person indexical, as in (18).

(18)   Mary: How's the cake?
            Sam: It tastes good to me.
            Sue: No it doesn't!

In both (17) and (18), Sue seems to be contradicting or disagreeing with Sam, but not in the same way. In (17), it is very likely that Sue assumes Sam is speaking sincerely and believes that he likes the cake – she is just disagreeing because *she* does not like the cake. I will refer to this pattern of disagreement in dialogue as "subjective disagreement." Compare this to (18), on the other hand, where Sue is not expressing anything about whether she herself likes the cake, but is rather claiming that *Sam* doesn't really like the cake, and/or that he is speaking insincerely. (We might call this "objective disagreement.") In other words, Sue's short-answer response in (17) contains the ellipsis shown in (19), whereas her response in (18) contains the ellipsis shown in (20).

(19)   Sue: No it isn't [tasty]!

(20)   Sue: No it doesn't [taste good to you]!

Put simply, if *tasty* came with an understood first-person indexical, then we would expect (17) to be an incoherent discourse in the same way that (21) is.

(21)   Sam: I'm a doctor.
            Sue: # No, I'm not!

The dialogue in (17) may have the flavor of being a futile or childish disagreement to engage in, but it doesn't reach anywhere near the level of serious incoherence seen in (21).

This is all another way of saying that when a taste predicate actually has a first-person experiencer, this represents the use of taste predicates illustrated in (16), rather than the more interesting use illustrated in (17).

Now let's consider the "generic" approach. One might suggest that in (17), *tasty* means something like 'tastes good to people in general' or 'tastes good to most people' (or something similar). The problem with this is that it would predict that sentences like (22)-(24) should sound contradictory (see Lasersohn, 2005, pp. 654-655). However, they sound perfectly coherent, and seem to express the speaker's awareness of their own unusual taste.

(22)   This cake is tasty, although most people would hate it.

(23)   This cake is tasty, but I'm the only one who thinks so.

(24)   This cake is tasty, but everyone else I've asked seems to disagree.

At this point I will take it as given that a simple "implicit argument" account will not work for taste predicates. Readers who would like additional convincing should refer to the works already cited.

I should make it clear here that when I say taste predicates have two separate "uses," I don't mean to claim that an actual ambiguity is involved. A systematic ambiguity would be one way to technically model the two uses, but in fact what I will be assuming is slightly different. As we will see below, I adopt a view where taste predicates come with an "experiencer" argument slot that has the option of being filled in by two different kinds of things. I make reference to two separate "uses" only to make it clear that the two options should not be confused with each other.

3.2. Centered Worlds Approach to Taste Predicates

Now let me summarize the analysis of taste predicates that I adopt here. This is essentially the view I developed in Stephenson (2007), which built on and modified the view of Lasersohn (2005). On this view, propositions are treated as sets of world-individual pairs rather than sets of worlds (or world-time-individual triples rather than world-time pairs; here I will be systematically ignoring times). In other words, a sentence is true not at a world but at a world-individual pair. Thus sentence intensions in effect have type <s, et>. More generally, if the extension of an expression is of type σ, its intension in this system will now be of type <s, eσ>. Lasersohn calls his new individual parameter the "judge," reflecting the role of subjective judgment in determining what counts as tasty, fun, and so on. Since I will be extending the view to cases without this obvious role for judgment, I prefer to construe the semantics in terms of centered worlds, and will call this individual the "center" rather than the judge. In the discussion below, ordered pairs will stand for centered worlds; for example, <w, j> stands for the world w centered on individual j. I will use $[\![\alpha]\!]^{w,j}$ for the denotation of an expression α at a centered world <w, j>. (Here, *j* is used after Lasersohn's "judge" terminology.)

As I proposed in Stephenson (2007), I assume that on their basic meanings, taste predicates are two-place predicates, as shown in (25).

(25) $[\![tasty]\!]^{w,j} = [\lambda y . [\lambda x . x \text{ tastes good to } y \text{ in } w]]$
            $[\![fun]\!]^{w,j} = [\lambda y . [\lambda x . x \text{ is fun for } y \text{ in } w]]$
            $[\![entertaining]\!]^{w,j} = [\lambda y . [\lambda x . x \text{ is entertaining to } y \text{ in } w]]$

The first argument of these predicates is the experiencer of taste, enjoyment, and so on. Lasersohn links this argument directly to the world center (in his terms, the judge parameter), but I have argued (Stephenson, 2007) that they should be connected only indirectly, which is what I'll be doing here. In other words, *tasty* (for example) expresses the relation that holds between those pairs of individuals <x, y> such that x tastes good to y.

In some cases, the first argument of a predicate of personal taste is overt, as in a sentence like *The roller coaster is fun for Sam*. In other cases, I assume, this argument is supplied covertly in one of two ways. The first possibility is for the context to provide a salient individual. This amounts to positing silent referential pronouns, which I will write as pro$_x$. So, for example, if the cat (let's call her Princess again) is particularly salient in the context, then *tasty* might take the silent item pro$_{Princess}$ as its first argument. The resulting meaning of the predicate would be as in (26).

(26) $[\![tasty \text{ pro}_{Princess}]\!]^{w,j} = [\lambda x . x \text{ tastes good to Princess in } w]$

This simply denotes the set of things that taste good to Princess.

The second way that the first argument of a predicate of personal taste can be supplied covertly is in the form of a special silent nominal PRO_J, which refers directly to the center of the world of evaluation. That is, it has the lexical entry in (27).

(27) $[\![PRO_J]\!]^{w,j} = j$

For example, if *tasty* takes PRO_J as its first argument, then the result (evaluated at a world w with center j) is the set of things that taste good to j in w. This is shown in (28).

(28) $[\![\text{tasty } PRO_J]\!]^{w,j} = [\lambda x \,.\, x \text{ tastes good to j in w}]$

Thus the sentence *The cake is tasty* (where the implicit argument of *tasty* is taken to be PRO_J) is true at a pair <w, j> iff the cake tastes good to j in w, as shown in (29). Note that the denotations in (27)-(29) rely crucially on the value of the world center; I will call an expression "center-dependent" when this is the case.

(29) $[\![\text{The cake is [tasty } PRO_J] \,]\!]^{w,j} = 1$ iff the cake tastes good to j in w

Here I will be focusing on sentences like (29) in the case where they are embedded under attitude reports; we will see that this has an effect on the world center that is somewhat akin to binding. For discussion of taste predicates and other center-dependent expressions in unembedded sentences, see, e.g., Lasersohn (2005), Egan (2007), and Stephenson (2007). (Lasersohn discusses taste predicates, Egan discusses epistemic modals, and my 2007 paper argues that the two should be given a similar treatment).

3.3. Attitude Predicates in a Centered Worlds Semantics

Once propositions are treated as sets of centered worlds rather than sets of worlds, it becomes particularly straightforward to capture *de se* attitudes. Recall, for example, the definition of doxastic alternatives from (5), repeated in (30).

(30)   Doxastic Alternatives:
                 $Dox_{w,x} = \{<w', y> :$ it is compatible with what x believes in w that x (x's self) is y in $w'\}$

On the current approach, a person's set of doxastic alternatives is simply a proposition – that is, a set of centered worlds. Therefore we can go back to treating attitude predicates as relations between individuals and propositions. For example, we can give *think* and *want* the meanings in (31)-(32). Here $\mathbf{p_S}$ indicates the set characterized by p, i.e., $\{<w', x> : p(w')(x) = 1\}$.

(31) $[\![\text{think}]\!]^{w,j} = [\![\text{believe}]\!]^{w,j} = [\lambda p_{<s,\, et>} \,.\, [\lambda z_e \,.\, Dox_{w,z} \subseteq p_S] \,]$

(32) $[\![\text{want}]\!]^{w,j} = [\lambda p_{<s,\, et>} \,.\, [\lambda z_e \,.\, Want_{w,z} \subseteq p_S \,]$

This says that "z thinks that p" is true iff z's doxastic alternatives are a subset of p – in other words, if p is true at all of z's doxastic alternatives. Similarly, "z wants p" is true iff z's 'want' alternatives are a subset of p. I've used set notation in (31)-(32), but note that these meanings are equivalent to (33)-(34).

(33) $[\![\text{think}]\!]^{w,j} = [\![\text{believe}]\!]^{w,j} = [\lambda p_{<s,\, et>} \,.\, [\lambda z_e \,.\, \forall <w', y> \in Dox_{w,z} : p(w')(y) = 1] \,]$

(34) $[\![\text{want}]\!]^{w,j} = [\lambda p_{<s,\, et>} \,.\, [\lambda z_e \,.\, \forall <w', y> \in Want_{w,z} : p(w')(y) = 1] \,]$

As written in (33)-(34), these meanings are essentially exactly the same as the ones given earlier in Section 2.2, (7)-(8), for control predicates. The difference is only that now the sentential complement of the attitude predicate is always taken to be something that expresses a proposition rather than a property. In other words, the type $\langle s, et\rangle$ now corresponds to the intension of a sentential (type t) expression rather than the intension of a set-denoting (type $\langle e, t\rangle$) expression. The compositional rules needed for the centered worlds system are given in (35)-(36). Note that only the intensional rule needs to be changed from the version given in Section 2.2.

(35)   **Functional Application (FA)**: If α is a complex expression formed by combining two expressions β and γ, and $[\![\gamma]\!]^{w,j}$ is in the domain of $[\![\beta]\!]^{w,j}$, then $[\![\alpha]\!]^{w,j} = [\![\beta]\!]^{w,j}$ ($[\![\gamma]\!]^{w,j}$).

(36)   **Intensional Functional Application (IFA)**: If α is a complex expression formed by combining two expressions β and γ, and $[\lambda w'_s . [\lambda j'_e . [\![\gamma]\!]^{w',j'}]]$ is in the domain of $[\![\beta]\!]^{w,j}$, then $[\![\alpha]\!]^{w,j} = [\![\beta]\!]^{w,j}$ ($[\lambda w'_s . [\lambda j'_e . [\![\gamma]\!]^{w',j'}]]$).

3.4. Taste Predicates in Attitude Reports

A crucial property of this analysis is the way it interacts with the center-dependent semantics for taste predicates from Section 3.2 above. Consider sentences like (37)-(38), which contain a predicate of personal taste with implicit argument PRO$_J$.

(37)   Sue thinks the cake is tasty **PRO$_J$**.

(38)   Sue wants the cake to be tasty **PRO$_J$**.

The predicted meanings for (37)-(38) are given in (39)-(40).

(39) $[\![(37)]\!]^{w,j} = [\![\text{think}]\!]^{w,j}$ ($[\lambda w' . [\lambda j' . [\![\text{the cake is tasty PRO}_J]\!]^{w',j'}]]$) (Sue)
         $= 1$ iff $\forall \langle w', y\rangle \in \text{Dox}_{w,\text{Sue}}$: the cake tastes good to y in w$'$

(40) $[\![(38)]\!]^{w,j} = [\![\text{want}]\!]^{w,j}$ ($[\lambda w' . [\lambda j' . [\![\text{the cake is tasty PRO}_J]\!]^{w',j'}]]$) (Sue)
         $= 1$ iff $\forall \langle w', y\rangle \in \text{Want}_{w,\text{Sue}}$: the cake tastes good to y in w$'$

According to these meanings, (37) is true iff the cake is tasty at all of Sue's doxastic alternatives – that is, if Sue believes that the cake tastes good to Sue herself. Similarly, (38) is true iff Sue wants the cake to taste good to Sue herself. This seems to be correct.[4] Notice that, roughly speaking, this means that attitude predicates effectively "bind" the world center by linking it to the attitude holder.

     The meanings in (39)-(40) also predict that PRO$_J$ will be interpreted *de se* under attitude predicates, since doxastic alternatives and 'want' alternatives crucially involve a *de se* counterpart. To test this prediction, we need to set up a context where, for example, Sue does not find something tasty, but thinks that a particular person does find it tasty, unaware that that person is Sue herself. Consider the context in (41), for instance.

(41)   [Context: Sue works as an actress in food commercials. Generally, of course, she is willing to pretend to like foods she dislikes. There's only one thing she really can't stand, which is tomato soup, and in the past she has absolutely refused to do

---

[4] (38) also has a salient reading on which Sue wants the cake to taste good to some other person or people (perhaps the people who are going to eat the cake). This reading arises when *tasty* takes a silent referential argument instead of PRO$_J$.

commercials for it. Recently, however, she was in particularly dire financial need, and finally agreed to do a commercial for tomato soup. The filming went off without a hitch, but she was so disgusted that she immediately went home and drank several mint juleps just to get the tomato taste out of her mouth. She turned on her favorite cooking show and promptly fell asleep on her living room couch. She later happened to wake up in the middle of the night right when her own tomato soup commercial was airing for the first time. In her sleepiness and drunkenness, she thought that the cooking show was still on and that the actress (Sue herself) was the chef enjoying tomato soup. Sue says to herself:]

Tomato soup is disgusting – but obviously it tastes good to that woman on T.V.

It seems to me this could not be reported as in (42), suggesting that the prediction is correct and PRO$_J$ is in fact interpreted *de se*.

(42)   Sue thinks that tomato soup tastes good.

4. <u>Proposal for Control</u>

In this section, I present my proposal for the semantics of control. The crucial claim here is that PRO directly refers to the world center. In Sections 4.1 and 4.2, I show how this proposal (like other semantically based accounts of control) captures two key properties of control, namely its obligatory *de se* interpretation and certain locality phenomena. In Section 4.3, I return briefly to the opening observation about sloppy identity readings in ellipsis. In Section 4.4, I extend this approach to cases of object control.

4.1. PRO as PRO$_J$

Let's look again at a typical control construction such as (43).

(43)   Sue wants **PRO** to go on the roller coaster.

Suppose that PRO in (43) simply refers directly to the world center. Then the embedded clause, *(PRO) to go on the roller coaster*, has the meaning in (44). Putting this together with the meaning for *want* from Section 3.3, the predicted meaning for (43) is (45).

(44) $[\![$PRO to go on the roller coaster$]\!]^{w,j}$
             $= [\![$PRO$_J$ to go on the roller coaster$]\!]^{w,j} = 1$ iff j goes on the roller coaster in w

(45) $[\![$Sue wants [PRO$_J$ to go on the roller coaster] $]\!]^{w,j}$
             $= [\![$wants$]\!]$ ([λw$'$. [λj$'$. $[\![$PRO$_J$ to go on the roller coaster$]\!]^{w',j'}$]]) (Sue)
             $= 1$ iff $\forall$<w$'$, y> $\in$ Want$_{w,Sue}$: y goes on the roller coaster in w$'$

This says that (43) is true iff all of the situations compatible with Sue's desires are such that Sue (herself) goes on the roller coaster. This is correct, and captures the obligatory *de se* interpretation of PRO in essentially the same way as the property view, semantically speaking.

   As I hope I have already made clear, it's no accident that my proposal has the same result as Chierchia's property view. I treat propositions as sets of world-individual pairs, which is exactly what properties are on standard views. The difference here is that on the centered worlds view, all sentence-like expressions are assigned this type – not just those embedded by control verbs. Moreover, this move is independently motivated by the behavior of taste predicates and other

expressions (as argued by Lasersohn, 2005; Stephenson, 2007). By the same token, this proposal is mainly about the semantics of control, and is not intended to say anything new about the syntactic properties or distribution of PRO.

4.2. Doubly Embedded Cases

Now consider an example like (46), where a control construction is embedded within another attitude report. It is well known that in cases like this, the implicit subject of the lowest clause (conventionally PRO; PRO_J on my view) must be controlled by the lower, i.e., closest attitude holder (in this case, Bill), and not the higher one (in this case, Sue). In other words, (46) can't be understood to mean that Sue thinks that Bill wants *her* to go to the party.

(46)   Sue thinks that Bill wants **PRO_J** to go to the party.

This requirement follows directly from the compositional semantics on my view. For example, the meaning predicted for (46) is shown in (47).

(47) $[\![(46)]\!]^{w,j} = [\![\text{Sue thinks [Bill wants [PRO}_J \text{ to go to the party]] }]\!]^{w,j}$
            $= [\![\text{think}]\!]^{w,j} ([\lambda w' . [\lambda j' . [\![\text{Bill wants PRO}_J \text{ to go to the party}]\!]^{w',j'}) (\text{Sue})$
            $= 1 \text{ iff } \forall <w', y> \in \text{Dox}_{w,\text{Sue}} : \forall <w'', z> \in \text{Want}_{w',\text{Bill}} : z \text{ goes to the party in } w''$

According to (47), *Sue thinks that Bill wants to go to the party* is true iff in all of Sue's doxastic alternatives, all of Bill's 'want' alternatives $<w'', z>$ are such that z goes to the party in w'' – that is, iff Sue thinks it is the case that Bill wants to have the property of going to the party. The crucial thing here is that the most embedded clause, *PRO_J to go to the party*, expresses the proposition that is true at a world-individual pair $<w, j>$ iff j goes to the party in w. When this is taken as an argument by *want*, the implicit subject of *go to the party* is irreversibly linked to the subject of *want*.

4.3. Ellipsis

This paper began with the observation that in both (48) and (49), only a "sloppy identity" reading is possible.

(48)   Sam thinks that rollercoasters are fun **PRO_J**, and Sue does too.   [= (1)]

(49)   Sam wants **PRO** to be famous, and Sue does too.   [= (2)]

On the centered worlds approach, we can make sense of the lack of "strict" identity readings. In both of these cases, the elided VP contains an attitude predicate (*think* or *want*) that embeds a phrase containing PRO or PRO_J. As we have already seen, this automatically links PRO/PRO_J to the attitude holder. Since the attitude holder is the only part that changes in the second conjunct (other than the eliding process itself), PRO_J and PRO become automatically linked to Sue in the second conjunct of both (48) and (49).

    Another way to look at it is this: On the centered worlds approach, PRO (and PRO_J) in the first conjuncts of (48)-(49) don't actually pick out Sam as a "referent." What gives rise to their link to Sam is crucially the fact that Sam is the holder of an attitude expressed in the higher clause. In the second conjuncts (with ellipsis) the attitude holder changes to Sue, and so PRO/PRO_J are automatically linked to Sue in the same way.

4.4. Object Control

The view of PRO as PRO$_J$ can easily be extended to the case of object control, as in (50). I will illustrate this with *persuade*, but similar things can be said about other object control verbs such as *tell*, *defy*, *ask*, and so on.

(50)   Sue persuaded Mary to take Sam to the movies.

I assume that (50) has the structure in (51).

(51)   Sue [$_{VP}$ persuaded [Mary] [$_S$ **PRO$_J$** to take Sam to the movies]]

What object control verbs seem to have in common is that they all in some way involve one individual doing something with the intention of getting another individual to have a particular attitude towards some other proposition or action (see, e.g., Comrie, 1984; Sag & Pollard, 1991). For example, in (51), Sue says something with the intention of getting Sam to intend to go to the movies. Since intending is an attitude in its own right, I will express it in terms of "intention alternatives," defined in (52).

(52)   Intention alternatives:
            Intend$_{w,x}$: {<w′, y> : it fits with what x intends in w for x to be y in w′}

Using this notion, we can then give *persuade* the lexical entry in (53).

(53) $[\![persuade]\!]^{w,j} = [\lambda x_e . [\lambda p_{<s, et>} . [\lambda y_e .$ y communicates with x in a way that causes it to be the case that $\forall <w′, z> \in$ Intend$_{w,x}$: $p(w′)(z) = 1]]]$

This says, roughly speaking, that "y persuades x (to) p" means that y communicates with x in a way that causes x to intend p. Since p is evaluated with respect to the intention alternatives of the direct object ("x"), the judge parameter is in effect shifted to the direct object. Thus the meaning of (50) is predicted to be as shown in (54).

(54) $[\![$Sue persuaded Mary to take Sam to the movies$]\!]^{w,j} = [\![persuade]\!]^{w,j}$ (Mary)
            ([$\lambda w′ . [\lambda j′ . [\![PRO_J$ to take Sam to the movies$]\!]^{w′,j′}$]]) (Sue)

            = 1 iff Sue communicated with Mary in w in a way that caused it to be the case that $\forall <w′, z> \in$ Intend$_{w,Mary}$: z takes Sam to the movies

This says that (50) is true iff Sue communicated with Mary in a way that made it the case that in all of Mary's intention alternatives <w′, z>, z takes Sam to the movies – that is, if Sue caused Mary to intend for Mary herself to take Sam to the movies.

5. <u>Comparison to Alternative Views</u>

Now I'll turn to comparisons between the view I've proposed here and other possible or existing views, starting with a Chierchia-type view. The main difference between the centered worlds approach to control and a Chierchia-style property view involves general considerations of theoretical simplicity. The centered worlds approach allows us to give all sentential expressions the same semantic type: their extensions are type t, and their intensions are type <s, et>. This in turn lets us give a unified semantics for attitude predicates in control and non-control contexts. Of course, it's crucial that there is independent motivation for treating propositions as type <s, et> rather than <s, t> in the first place; I take it that the cited work on taste predicates and epistemic modals provides this motivation.

I have analyzed PRO using machinery (including centered worlds) that is independently motivated by the semantics of taste predicates. However, other kinds of machinery have also been independently motivated by other phenomena, and we can ask whether PRO should instead be analyzed using one of them. In particular, in the context of work on shifting indexicals and logophors, Anand & Nevins (2004) suggest that it may be possible to analyze PRO as an indexical that refers to a participant in an embedded context.[5] Below I'll discuss some of the differences between that kind of view and the one I've proposed here, after I give a bit of background on shifting indexicals and logophors.

The motivation for a system with shifting context parameters comes from the behavior of shifting indexicals of the kind found in Amharic and Zazaki[6] (Schlenker, 1999, 2003; Anand & Nevins, 2004; Anand, 2006), and logophors of the kind found in West African languages such as Ewe, Yoruba, and Abe (Hagège, 1974; Clements, 1975; Pulleyblank, 1986; Koopman & Sportiche, 1989). One typical example of a shifting indexical is given in (55), from Amharic. The first-person indexical in (55) can either refer to the speaker of the utterance or to the reported speaker, John.

(55)   **[Amharic]**

ĵon   ĵǝgna   nǝ-ññ   yɨl-all
John   hero   be.PRES-ls   says-3sm
'John says that {I am, he is} a hero.'
[Lit: "John says that I am a hero."]

(Schlenker, 2003, no. (53))

A typical example of a West African-type logophor is given in (56), from Ewe. Here the pronoun *yè* can only refer to the reported speaker, Kofi.

(56)   **[Ewe]**
Kofi   be   yè-dzo
Kofi   say   LOG-leave
'Kofi said that he (Kofi) left.'

(Clements, 1975, no. (1))

Crucially, it has been claimed that both shifting indexicals (when they have their shifted interpretations) and logophors generally must be interpreted *de se*.[7] That is, a sentence like (55) can only report a situation where John said, "I am a hero," not one where, for example, he unknowingly saw himself on T.V. and said, "that man is a hero."

An influential framework that has been developed for analyzing these items is one with context shifting operators (see, e.g., Schlenker, 2003; Anand, 2006). When shifting indexicals

---

[5] Thanks to an anonymous reviewer for reminding me of this.
[6] Amharic is a Semitic language spoken in Ethiopia; Zazaki is an Indo-Iranian language spoken by ethnic Kurds in Turkey.
[7] This claim is difficult to test in fieldwork and has not been verified for every relevant language and item, but Schlenker (1999) makes the claim for Amharic 'I' and discusses the issue for logophors (citing, e.g., Kusumoto (1998), for Bafut logophors). Anand (2006) discusses the issue in more detail. At this point it at least seems reasonable to take it as a working hypothesis that logophors and shifting indexicals are *de se*.

appear under these operators, they are evaluated with respect to the shifted context rather than the main context of utterance. Abstracting away from some details and variations, this kind of framework treats propositions as sets of contexts, where a context can be construed as a tuple of a world, author, addressee, and other necessary parameters. For present purposes, we can simplify the comparison further by thinking of contexts as world-individual-individual triples (where the individuals are the author and addressee, respectively). In the discussion below, when dealing with a shifting-indexical approach, I will write $[\![\alpha]\!]^{w,a,b}$ for the denotation of α at a context in world w with author a and addressee b. As before, when discussing the centered worlds approach, I will continue to write $[\![\alpha]\!]^{w,j}$ for the denotation of an expression α at world w with center j.

Now let's consider what it would look like if we treat PRO as a shifting indexical. First, the lexical meaning for PRO on the centered worlds approach is repeated in (57).

(57) $[\![PRO]\!]^{w,j} = j$

A shifting indexical approach would need to make a distinction between subject and object control. The lexical entries for subject and object PRO would be along the lines of (58) and (59), respectively.

(58) $[\![PRO_{subj}]\!]^{w,a,b} = a$

(59) $[\![PRO_{obj}]\!]^{w,a,b} = b$

These say that, evaluated at a world w, author a, and addressee b, the "subject" version of PRO refers to a and the "object" version refers to b. I will illustrate the semantic predictions of the two approaches using the typical subject and object control constructions *Sam wants to leave* and *Sue persuades Sam to leave*. On the centered worlds approach, the predicted meanings are given in (60)-(61).

(60) $[\![\text{Sam wants [PRO to leave]}]\!]^{w,j} = 1$ iff in all centered worlds <w′, y> such that it's compatible with Sam's desires for him to be y in w′, y leaves.

(61) $[\![\text{Sam persuades Sue [PRO to leave]}]\!]^{w,j} = 1$ iff Sam communicates with Sue in a way that causes it to be the case that in all centered worlds <w′, y> such that it's compatible with Sue's intentions in w for her to be y in w′, y leaves.

On a shifting indexical view, the predicted meanings would be along the lines of (62)-(63).

(62) $[\![\text{Sam wants [PRO}_{Subj}\text{ to leave]}]\!]^{w,a,b} = 1$ iff in all contexts <w′, a′, b′> (where a′ is the author) such that it's compatible with Sam's desires in w for him to be a′ in w′, a′ leaves.

(63) $[\![\text{Sam persuades Sue [PRO}_{Obj}\text{ to leave]}]\!]^{w,a,b} = 1$ iff Sam communicates with Sue in w in a way that causes it to be the case that in all contexts <w′, a′, b′> (where b′ is the addressee) such that it's compatible with Sue's intentions in w for Sue to be b′ in w′, b′ leaves.

Both approaches seem to give the correct semantics for these basic cases, including the *de se* interpretation of PRO. Both also make use of extra machinery that is independently motivated by other phenomena: centered worlds are motivated by the behavior of taste predicates, while author and addressee parameters are motivated by shifting indexicals. There are a few differences, though, which I turn to now.

A small but obvious difference between the two approaches is that the shifting indexical approach needs to treat subject and object controlled PRO differently, whereas the centered worlds approach can give a single meaning for PRO. In terms of overall simplicity, then, this gives a slight advantage to the centered worlds approach.

Another difference, closely related to the first one, has to do with predicted generalizations about the semantic role of subject and object PRO. As discussed earlier, the centered worlds approach makes it a key property of PRO – both subject controlled and object controlled – that it is linked to a propositional attitude introduced in the lexical semantics of the control predicate. On the other hand, the shifting indexical approach makes it a key role of PRO that it is linked to a certain participant in an utterance-like context – subject controlled PRO is linked to an author (which could be an attitude holder) and object controlled PRO is linked to an addressee. Since the notion of 'author' is generally taken to include the holder of an attitude, a real difference can only come out with object control predicates. If the centered worlds approach is correct, then, we might expect to find object control predicates whose objects are clearly the holder of an attitude, but not necessarily the addressee of any speech-like event. If, on the other hand, the shifting indexical approach is correct, we might expect to find the reverse: object control predicates whose objects are clearly the addressee in a speech-like event but not necessarily the (intended) holder of an attitude.

Finding examples of either kind turns out to be tricky, but two examples of the first kind are *convince* and *discourage* as used in (64) and (65).

(64)   The rainy weather discouraged Sue from going for a bike ride.

(65)   The rainy weather convinced Sue to stay home.[8]

It's fairly clear that these cases do not involve any speech act (certainly the rainy weather isn't discouraging or convincing Sue by talking to her), and it's equally clear that they do crucially involve a change in Sue's attitude towards going for a bike ride and staying home, respectively. Thus *discourage* and *convince* give evidence for the centered worlds view over the shifting indexical view of object control.

Now, are there examples of object control predicates of the opposite kind – where the object is an addressee but not an attitude holder? On the face of it, there do seem to be plausible cases, such as *ask* and *order* as used in (66)-(67).

(66)   Sam asked Sue to leave, but she didn't hear him.
(67)   Sam ordered Sue to leave, but she didn't hear him.

---

[8] Thanks to Nicole Palffy-Muhoray for useful discussion of these examples. Many naturally occurring examples similar to (64) and (65) can be found through a simple Google search for "the weather convinced me to" and "the weather discouraged me from." Here are a few:
(i) Yeah, the weather convinced me to stay in last night.
        [from http://gimpysoft.com/2007/01/13/ok-i-lied-see-you-tonight/, accessed Feb. 12, 2010]
(ii) The taste of the foods along with the weather convinced me to establish my roots in California.
        [from http://www.hawaiianhabaneroheat.com/, accessed Feb. 10, 2010]
(iii) This winter, the weather discouraged me from riding much, so I went back into diet mode…
        [from http://science.slashdot.org/science/03/04/12/2357234.shtml?tid=134, accessed Feb. 10, 2010]
(iv) And then the weather discouraged me from knitting anything summery.
        [from http://stashqueen.typepad.com/stash_queen/2009/07/index.html, accessed Feb. 10, 2010]

In these examples, Sue is clearly the addressee of an utterance of Sam's, but she does not come to hold an attitude towards the proposition that the world center leaves (i.e., that Sue herself leaves) since she isn't aware that the utterance took place. However, Sam does have to intend for Sue to hear him, and to consequently gain the relevant attitude, regardless of whether he succeeds, and so the meaning of *ask* or *order* will still indirectly involve an attitude held by Sue. For example, a meaning for *ask* could be along the lines of (68).

(68) $[\![asks]\!]^{w,j} = [\lambda x_e \,.\, [\lambda p_{<s,\,et>} \,.\, [\lambda y_e \,.\, y$ makes a request of x with the intention of making it the case that $\forall <w', z> \in Intend_{w,x}: p(w')(z) = 1]\,]\,]$

This says that "A asks B to VP" is true iff A makes a request of B with the intention of making it the case that B intends to VP. Thus an attitude of B's is still involved, even though it's embedded under an attitude of A's. In fact, it's a routine observation in pragmatics that communicative acts generally involve the speaker intending to cause the addressee to come to have some attitude or other. Thus any object control verb that entails a speech act should be amenable to this kind of analysis.

There is one more difference between the two approaches, also closely related to the previous ones, which is brought out when we consider sentences like (69a), which I take to have the structure in (69b).

(69)   (a)   Playing baseball is fun.
       (b)   [PRO playing baseball] is [fun PRO_J]

Note that the implicit subject of *playing baseball* (PRO) is understood to be the same as the person who has the experience of fun – that is, (69) cannot be understood as saying that some person A finds it fun when another person B plays baseball. (This observation is due to Epstein, 1984.) In particular, notice that (69) gives rise to the same kind of "subjective disagreement" found with taste predicates more generally, which was discussed in Section 3.1 above. For instance, Sam's response in (70) can be understood as expressing the fact that Sam does not find it fun when he (himself) plays baseball. This contrasts as expected with (71), where Sam's response can only be understood as claiming that *Sue* does not find it fun when *she* plays baseball.

(70)   Sue: Playing baseball is fun.
             Sam: No it isn't!

(71)   Sue: Playing baseball is fun for me.
             Sam: No it isn't!

The main point here is that in (70), the interpretation of PRO (i.e., the implicit subject of *playing baseball*) co-varies with the experiencer of *fun*.[9] The question, then, is how this covariance arises. On the centered worlds approach, very little needs to be said: since PRO has the same semantics as PRO_J, the implicit subject of *playing baseball* and the implicit experiencer of *fun* are for all intents and purposes the same lexical item, and so it's completely expected that their interpretation would co-vary, in the same way that, for example, the reference of *I* and *myself* co-vary in different speakers' utterances of *I see myself*.

---

[9] The same covariance also shows up in "Super Equi" constructions such as (i), where it is captured on my view in a parallel way.
(i)   Sam thinks that playing baseball is fun.

On a shifting indexical approach, in contrast, it would be crucial that PRO be embedded under a context shifter. If it were not embedded, we would expect it to act like a normal first or second person indexical, which it clearly does not. A context shifting operator could perhaps be built into the taste predicate, or into the implicit experiencer argument of the taste predicate; in this case, though, we would expect shifted indexicals to be possible (in languages that have them) in sentences with taste predicates more generally. That is, we would expect to find the equivalent of a sentence like either (72) or (73) in a language like Zazaki or Amharic, with the interpretation 'Sam's cake tastes good to Sam.'

(72)   My cake tastes good to Sam.
(73)   Your cake tastes good to Sam.

It seems unlikely that such interpretations are available and have not previously been observed, but I leave this to others to test.

6. <u>Remaining Issues</u>

In the previous section, I discussed some advantages of a centered worlds approach. At this point I'll turn to some problems and challenges for my proposal.

6.1. A Puzzle about *Manage*

An anonymous reviewer points out a problem for my view in giving an appropriate semantics for the verb *manage*. To see it, first look at the simple dialogue in (74), which contains no control verb.

(74)   Sam: This time, John was charming.
            Sue: No he wasn't!

As with similar dialogues with other taste predicates, there is a salient reading on which, roughly speaking, Sam is expressing the fact that John charmed him and Sue is expressing the fact that John did not charm her. As discussed in Section 3, I assume that this reading arises when the implicit argument of *charming* is PRO$_J$. In other words, the proposition that Sue is disagreeing with (namely, that John was charming) is the one expressed by the structure in (75a), with the denotation (in set terms) in (75b).

(75) (a)   [John was charming PRO$_J$]

      (b) $\{<w, x> : \text{John charmed x in w}\}$

Now consider a similar dialogue where *manage* is added, as in (76).

(76)   Sam: This time, John managed to be charming.
            Sue: No he didn't!

There is a salient reading of (76) which is essentially the same as the relevant reading of (75) except with the added requirement (presumably a presupposition) that John made some effort to be charming. We can see this even more clearly if we contrast (76) with (77), where the argument of *charming* is made explicit and this kind of reading goes away.

(77)   Sam: This time, John managed to charm me.
            Sue: No he didn't!

In (77), Sue's response can only be understood as denying that John charmed *Sam*, not denying that John charmed Sue herself.

Now, here's the problem with (76): If *manage* is a control verb, we would expect on my view for the embedded clause (*to be charming*) to have the subject PRO$_J$, and for the semantics of *manage* to introduce a mediating attitude that links this subject to Sam. On the other hand, in order for Sue's utterance to express the fact that John did not charm her, the implicit argument of *charming* should also be PRO$_J$, and moreover, this PRO$_J$ needs to not be embedded under any attitudes. Put another way, if we think of *NP managed to VP* as having two components, a presupposition that NP tried to VP and an assertion that x did VP, it does not seem to be possible on my view to give the VP a single meaning and structure for both components. What we seem to need instead is for the presupposition to make reference to a VP something like (78a), while the assertion makes reference to a VP like (78b).

(78) (a)   [PRO$_J$ to be charming pro$_x$]

       (b)   [John was charming PRO$_J$]

I leave this as an open problem.

6.2. Partial Control

Certain control verbs allow a "partial" interpretation, where the implicit subject is not identical to the subject of the higher clause, but rather is a larger group that is contextually salient and includes that individual (see, e.g., Lawler, 1972; Martin, 1996; Petter, 1998; Landau, 2000). "Partial control" verbs include *want* and *decide*, which are illustrated in (79).

(79) (a)   The chair decided to gather during the strike.

       (b)   Mary wants to meet at 6:00.

                                                      (based on Adler, 2006, no. (15d-e))

We can tell that the implicit subject of the infinitive is a group in each of these cases because *gather* and *meet* are collective predicates, as we can see from the unacceptability of (80a-b).

(80) (a)   */# The chair gathered during the strike.

       (b)   */# John met at 6:00.

I have very little to add to the discussion of the phenomenon of partial control and what determines whether a particular control verb allows it or not, but I would at least like to show that in principle it isn't an insurmountable problem for the view of PRO as PRO$_J$.

To account for partial control, Landau (2000, Ch. 2) assumes, among other things, that PRO can carry a feature for semantic plurality. Simplifying somewhat, this means that there is a "singular" PRO and a "plural" PRO. (It is crucial for him that these are semantic features, not syntactic phi-features.) Essentially, partial control occurs when the subject of the higher clause is singular but PRO is plural, which is allowed under certain conditions because of the particular way that agreement relations work between the higher and lower clause.

Without going into the details of Landau's analysis, I will just show that there is a coherent way to posit a plural version of PRO$_J$ which will yield the right interpretation for partial control cases. Borrowing an idea of Kratzer (2006, 2009), I assume that the plural version of PRO$_J$ (which I'll call PRO$_{J\text{-}PLUR}$) refers to the unique salient group containing the world center. A

lexical entry for PRO$_{\text{J-PLUR}}$ is given in (81). (The extra parameter of interpretation "c" stands for the context of utterance.)

(81) $\quad\quad\quad$ $\llbracket\text{PRO}_{\text{J-PLUR}}\rrbracket^{c; w,j} = G_c(j)$,
$\quad\quad\quad\quad\quad\quad$ where $G_c(x) =$ the salient group containing x in context c

For example, the partial control structure in (82a), which contains PRO$_{\text{J-PLUR}}$, is predicted to have the meaning in (82b).

(82) $\quad$ (a) $\quad\quad$ Mary wants [PRO$_{\text{J-PLUR}}$ to meet]

$\quad\quad$ (b) $\quad\quad$ $\llbracket\text{(a)}\rrbracket^{c; w,t,j} = \llbracket\text{wants}\rrbracket^{w,j}$ ([$\lambda w'$. [$\lambda j'$. $\llbracket\text{PRO}_{\text{J-PLUR}}$ to meet$\rrbracket^{w',j'}$]]) (Mary)
$\quad\quad\quad\quad\quad\quad$ $= 1$ iff $\forall <w', y> \in$ Want$_{w,\text{Mary}}$: $G_c(y)$ meets in w'

This says that *Mary wants to meet* is true iff for all of Mary's 'want' alternatives $<w', y>$, the salient group containing y meets in w', which captures the "partial" nature of the control.

6.3. Extensional Adjuncts and Non-Obligatory Control

There are at least two kinds of constructions which are often treated as containing PRO but which cannot (easily) be captured by the account proposed here. The first includes sentences with adverbial gerunds such as (83a-b) (see, e.g., Williams, 1992).

(83) $\quad$ (a) $\quad\quad$ Sam left without saying goodbye.

$\quad\quad$ (b) $\quad\quad$ Sue walked down the street (while) singing.

If the gerunds are taken to have PRO subjects, the structures for (83a-b) should be something like (84a-b), respectively.

(84) $\quad$ (a) $\quad\quad$ Sam [left [$_{\text{AdvP}}$ without **PRO** saying goodbye]]

$\quad\quad$ (b) $\quad\quad$ Sue [walked down the street [$_{\text{AdvP}}$ (while) **PRO** singing]]

The issue here is that the gerundive clauses cannot be plausibly treated as being semantically under an attitude. This means that there is nothing to shift the judge parameter to Sam in (84a) or Sue in (84b).

My own inclination is to say that adverbial gerunds are sufficiently different from typical control constructions that they should be given a separate analysis, but it is admittedly difficult to give non-circular arguments for this. (That is, part of the reason they seem different to me is probably that they so clearly do not involve attitudes.)

The issue is somewhat trickier for cases like (85).

(85) $\quad\quad\quad$ Tom felt sheepish. Pinching those elephants was foolish.

$\hfill$ (Adler, 2006, no. (24a), citing Bresnan, 1982)

On the one hand, the underlined subjectless clause *pinching those elephants* is clearly not embedded under any overt attitude predicate; on the other hand, it clearly does in some way express Tom's perspective and experience – in other words, we understand (85) as saying, more or less, that Tom felt sheepish because he thought that it was foolish of him to pinch the elephants. It seems at least initially plausible, then, that some kind of covert perspective-shifting operator is present that expresses an attitude, though I won't attempt to formalize this here.

Another case that has been called non-obligatory control is given in (86).

(86)   John said to <u>Mary</u> that it would be easy <u>to prepare herself</u> for the exam.

(Adler, 2006, no. (26))

In this case, I suggest that the non-obligatoriness of the control is an illusion. This is because *easy* itself has an implicit argument, which in this case is naturally understood as referring to Mary simply because she is salient and can corefer with the female reflexive *herself*. In other words, the structure of (86) is something like (87).

(87)   John said to <u>Mary</u> [that it would be [easy **pro_{Mary}**] [**PRO** <u>to prepare herself</u> for the exam]]

In effect, then, PRO is obligatorily controlled by the implicit argument of *easy*. In this way, it's similar to the Epstein examples discussed in Section 5 (see example (69) and footnote 9). The real issue with this example, then, is whether "being easy" can plausibly be treated as involving an attitude. It's not at all clear to me that this is the case, and so I leave this counterexample as another open problem.

7. <u>Conclusions</u>

In this paper, I have proposed a new twist on a semantically based view of control. I treat control complements essentially as properties (as in, e.g., Chierchia, 1989), but bring in the extra individual argument by linking it to Lasersohn's judge parameter. This makes the same key predictions as the property view with the additional advantage of letting all sentential expressions (including subjectless infinitives) share the same semantic type, $\langle s, et \rangle$. This in turn allows us to give a semantics for attitude predicates that fits seamlessly together with formal machinery independently needed for *de se* attitudes.

<u>References</u>

Adler, Allison (2006). *Syntax and Discourse in the Acquisition of Adjunct Control.* Ph.D. Thesis, MIT.

Anand, Pranav (2006). *De De Se*. Ph.D. Thesis, MIT.

Anand, Pranav and Andrew Nevins (2004). Shifty Operators in Changing Contexts: Indexicals in Zazaki and Slave. In R. Young (ed.), *Proceedings of Semantics and Linguistic Theory 14*, Ithaca, N.Y.: CLC Publications, pp. 20–37.

Bresnan, Joan (1982). Control and Complementation. *Linguistic Inquiry* 13: 343–434.

Castañeda, Hector-Neri (1966). 'He': A Study in the Logic of Self-Consciousness. *Ratio* 8: 130–157.

Castañeda, Hector-Neri (1968). On the Logic of Attributions of Self-Knowledge to Others. *Journal of Philosophy* 54: 439–456.

Chierchia, Gennaro (1989). Anaphora and Attitudes De Se. In R. Bartsch, J. van Benthem, and P. van Emde Boas (eds.), *Language in Context,* Dordrecht: Foris, pp. 1–31.

Clements, George (1975). The Logophoric Pronoun in Ewe: Its Role in Discourse. *Journal of West African Languages* 10: 141–177.

Comrie, Bernard (1984). Subject and Object Control: Syntax, Semantics, and Pragmatics. In *Proceedings of the Tenth Annual Meeting of the Berkeley Linguistics Society,* Berkeley, California: BLS, pp. 450–464.

Egan, Andy (2007). Epistemic Modals, Relativism, and Assertion. *Philosophical Studies* 133: 1–22.

Epstein, Samuel David (1984). Quantifier-pro and the LF Representation of PRO$_{ARB}$. *Linguistic Inquiry* 15: 499–505.

von Fintel, Kai and Anthony S. Gillies (2008). CIA Leaks. *Philosophical Review* 117: 77–98.

von Fintel, Kai and Irene Heim (2009). Lecture Notes on Intensional Semantics, Spring 2009 edition, MIT. URL: http://tinyurl.com/intensional

Hagège, Claude (1974). Les Pronoms Logophoriques. *Bulletin de la Société de Linguistique de Paris* 69: 287–310.

Koopman, Hilda and Dominique Sportiche (1989). Pronouns, Logical Variables and Logophoricity in Abe. *Linguistic Inquiry* 20: 555–589.

Kratzer, Angelika (2006). Building a Pronoun. Paper presented at Semantics and Linguistic Theory 16, University of Tokyo, March 22, 2006.

Kratzer, Angelika (2009). Making a Pronoun: Fake Indexicals as Windows into the Properties of Pronouns. *Linguistic Inquiry* 40: 187–237.

Kusumoto, Kiyomi (1998). Tenses as Logophoric Pronouns. Handout of talk given at the MIT/UConn/UMass Semantics Workshop, University of Connecticut, Storrs.

Landau, Idan (2000). *Elements of Control: Structure and Meaning in Infinitival Constructions.* Studies in Natural Language and Linguistic Theory, Vol. 51. Dordrecht: Kluwer.

Lasersohn, Peter (2005). Context Dependence, Disagreement, and Predicates of Personal Taste. *Linguistics and Philosophy* 28: 643–686.

Lawler, John (1972). A Problem in Participatory Democracy. Bloomington, Indiana: Indiana University Linguistics Club.

Lewis, David (1979). Attitudes *De Dicto* and *De Se. Philosophical Review* 88: 513–543.

Martin, Roger (1996). A *Minimalist Theory of PRO and Control.* Ph.D. Thesis, University of Connecticut, Storrs.

Morgan, Jerry (1970). On the Criterion of Identity for Noun Phrase Deletion. In *Papers from the Sixth Regional Meeting of the Chicago Linguistic Society,* Chicago: CLS, pp. 380–389.

Perry, John (1977). Frege on Demonstratives. *Philosophical Review* 86: 474–497.

Perry, John (1979). The Problem of the Essential Indexical. *NOÛS* 13: 3–21.

Petter, Marga (1998). *Getting PRO under Control*. LOT International Series, Vol. 8. The Hague: Holland Academic Graphics.

Pulleyblank, Douglas (1986). Clitics in Yoruba. In H. Borer (ed.), *The Syntax of Pronominal Clitics,* Syntax and Semantics, Vol. 19, Orlando, Florida: Academic Press, pp. 43–64.

Sag, Ivan and Carl Pollard (1991). An Integrated Theory of Complement Control. *Language* 67: 63–113.

Schlenker, Philippe (1999). *Propositional Attitudes and Indexicality.* Ph.D. Thesis, MIT.

Schlenker, Philippe (2003). A Plea for Monsters. *Linguistics and Philosophy* 26: 29–120.

Stephenson, Tamina (2007). Judge Dependence, Epistemic Modals, and Predicates of Personal Taste. *Linguistics and Philosophy* 30: 487–525.

Stojanovic, Isidora (2007). Talking About Taste: Disagreement, Implicit Arguments, and Relative Truth. *Linguistics and Philosophy* 30: 691–706.

Williams, Edwin (1992). Adjunct Control. In R. Larson, S. Iatridou, U. Lahiri, and J. Higginbotham (eds.), *Control and Grammar,* Studies in Linguistics and Philosophy, Vol. 48, Dordrecht: Kluwer, pp. 297–322.