Copy Raising and Perception

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1 Introduction

Copy raising, shown in (1), has received much less attention in theoretical linguistics than subject-to-subject raising, shown in (2), which has been a mainstay in the field since Rosenbaum (1967).

(1) Chris seemed like he enjoyed the marathon.

(2) Chris seemed to enjoy the marathon.

For example, a recent book-length overview of control and raising specifically sets copy raising aside (Davies and Dubinsky 2004: ix), only mentioning the topic in passing a handful of times (Davies and Dubinsky 2004: 56, 246, 252).

In this paper, we examine copy raising in two closely related Germanic languages, English and Swedish, and offer a formal analysis of its syntax and semantics. We concentrate particularly on the latter aspect and develop a new event semantics analysis of copy raising. In addition to augmenting the body of empirical data on copy raising, we show that far from being a marginal or theoretically uninteresting phenomenon, copy raising yields novel insights into a number of key theoretical issues, in particular language and perception, the theory of arguments and thematic roles, and the broader semantics of control and raising.

Copy raising casts new light on the linguistic encoding of perceptual reports. We investigate in detail the source of perception, which can be thought of as the stimulus in a perceptual event or state, and briefly examine the goal of perception, i.e. the perceiver. Our analysis of perceptual sources in copy raising in turn has consequences for the distinction between arguments/thematic roles and other participants in events and states. In particular, we argue that perceptual sources and goals are not linguistically encoded as semantic arguments. We examine the consequences of the semantics of copy raising, and raising more generally, and of perceptual sources and goals in particular, for theories of thematic roles. We argue that certain finer-grained distinctions must be introduced to linguistic theory to properly deal with the semantics of raising and copy raising. We demonstrate how our semantics for copy raising connects to the semantics of both control and standard raising. Copy raising and related perceptual constructions reveal a richer semantic space for control and raising than has hitherto been explored. Along the way, we observe and solve two empirical puzzles. The first concerns a contrast that holds in both Swedish and English between copy raising and subject-to-subject raising in certain contexts. The second concerns the distribution of an adjunct that encodes the source of perception in Swedish.

2 Copy raising in English and Swedish

In this section, we review the characteristics of copy raising and illustrate the phenomenon with examples from the two languages of interest, English and Swedish. The key data are largely parallel in the two, but there are also some differences, which will be pointed out below.

True copy raising is a phenomenon in which a raising verb takes a non-expletive subject and a complement containing an obligatory pronominal 'copy' of the subject:

(3) a. Tina seems like she's found the chocolate.

b. *Tina seems like Fred's found the chocolate.

(4) a. Tina verkar som om hon har hittat chokladen.
T. seems as if she has found chocolate.DEF
'Tina seems as if she has found the chocolate.'

b. * Tina verkar som om Fred har hittat chokladen.
T. seems as if F. has found chocolate.DEF

The grammatical (a) examples in (3–4) contain the pronouns *she* and *hon* which are coreferential with the main clause subjects. The (b) examples, however, do not contain coreferential pronouns ('pronominal copies'), and the sentences are ungrammatical.

English copy raising was initially noticed by Postal (1974: 268, fn.1) and was also touched on by Rogers (1971, 1973) in work that principally concerned what he called *flip perception verbs* (Rogers 1971, 1972, 1973, 1974). The topic has recently received renewed attention in work by Potsdam and Runner (2001), Asudeh (2002, 2004), and Fujii (2005). The first detailed investigation of copy raising was Joseph's (1976) work on Modern Greek, which was subsequently brought to wider attention by Perlmutter and Soames (1979). Copy raising is in fact not typologically uncommon and has been attested in a number of unrelated languages, including Samoan (Chung 1978), Hebrew (Lappin 1984), Irish (McCloskey and Sells 1988), Haitian Creole (Déprez 1992), Igbo (Ura 1998), and Turkish (Moore 1998); Polinsky and Potsdam (2006) cite further examples.

Swedish copy raising has not to our knowledge previously been discussed in the literature, but the following example is included in a recent comprehensive reference grammar (Teleman et al. 1999: vol. 4, p.56):[1]

(5) Han verkar som om han är lugnare nu.
he seems as if he is calmer now
'He seems like he is calmer now.'

Teleman et al. point out that the subjects must be coreferential, although they do not discuss the issue further.

Copy raising can be compared to 'canonical' raising, which has been a central area of investigation in theoretical linguistics for quite some time (Rosenbaum 1967, Postal 1974). An English raising example is given in (6a) and a Swedish example is given in (6b):

(6) a. Tina seems to have found the chocolate.
b. Tina verkar ha hittat chokladen.
T. seems have.INF found chocolate.DEF
'Tina seems to have found the chocolate.'

Raising examples alternate with sentences that have an expletive subject and a finite complement:

(7) a. It seems that Tina has found the chocolate.
b. Det verkar som om Tina har hittat chokladen.
it seems as if T. has found chocolate.DEF
'It seems as if Tina has found the chocolate.'

The finite complementation pattern is a key piece of evidence that the raised subject in the infinitival alternant is not an argument of the raising predicate, since the subject can instead be realized as an expletive. We adopt the standard assumption that *seem* has a single thematic argument, even when its subject is not an expletive (as in (6) or the copy raising examples).

For both Swedish and English, corpus searches reveal copy raising to be less frequently occurring than standard raising. Moreover, speakers often judge copy raising to be more colloquial than standard raising. In these respects, copy raising has a more 'marked' status than standard raising. Nevertheless, there is no shortage of copy raising examples in corpora, and native speakers judge copy raising examples to be grammatical.

Copy raising is similar to the finite complementation pattern, since it too apparently involves a finite complement:

[1] The example in Teleman et al. (1999) also includes *se ut* ('look'), which is a *perceptual resemblance verb* (see below).

(8) Tina seems like / as if / as though she adores ice cream.

(9) Tina verkar som om hon gillar glass.
T. seems as if she likes ice.cream.
'Tina seems as if she likes ice cream.'

Asudeh (2002, 2004), following previous work (Maling 1983, Heycock 1994, Potsdam and Runner 2001), argues that the complement to copy raising is in fact not a finite clause, but rather a predicative prepositional phrase, headed by *like* or *as* (to which we can now add *som* for Swedish), which in turn contains a finite complement. He assimilates the syntax of copy raising to predicative raising:

(10) Kim seems crazy / out of control.

(11) Kim verkar arg / i toppform.
K. seems angry / in top.shape
'Kim seems angry / in great shape.'

Despite taking a predicative complement, copy raising exhibits an alternation between a non-expletive and expletive subject, similar to the alternation between subject-to-subject raising and finite complementation in (6) and (7) above:

(12) a. Tina seems like she adores ice cream.
b. It seems like Tina adores ice cream.

(13) a. Tina verkar som om hon gillar glass.
T. seems as if she likes ice cream.
'Tina seems like she likes ice cream.'
b. Det verkar som om Tina gillar glass.
it seems as if T. likes ice cream
'It seems as if Tina likes ice cream.'

We will henceforth use the term *copy raising* for subcategorizations of the raising verbs *seem/appear/verka* with *like/as/som*-complements. We will refer to cases of copy raising in its expletive-subject alternant, as in (12b) and (13b), as *expletive-subject copy raising*. We will refer to cases of copy raising with a non-expletive subject and a copy pronoun in the complement, as in (12a) and (13a), as *true copy raising* or *non-expletive-subject copy raising*.

In English, raising examples alternate with *that*-clauses and copy raising examples alternate with complements introduced by *like* or *as if/though* clauses.[2] In standard Swedish, however, the complement is most commonly introduced by *som om* (a plain *som* is also common). Dialectally, one can also find examples introduced by *att* ('that') and *som att* ('as that'); (14) is parallel to the English example in (7a) above:

(14) % Det verkar att Tina har hittat chokladen.
it seems that T, has found chocolate.DEF
'It seems that Tina has found the chocolate.'

Since standard Swedish does not allow (14), *att*-complements will not be discussed in detail in this paper.

Asudeh (2002, 2004) observes that the true copy raising verbs in English are *seem* and *appear* with a *like/as*-complement, since these are the verbs that require a copy pronoun in their complements. He contrasts these with

[2] *As if* and *as though* seem to belong to a slightly higher register than *like*. The latter seems to be preferred in colloquial speech, although there are no doubt also subtle semantic and pragmatic differences between the three forms, which we set aside here. We will principally use only *like* in what follows.

perceptual resemblance verbs (Rogers's *flip perception verbs*; Rogers 1971, 1972, 1973, 1974): *look*, *sound*, *smell*, *feel*, and *taste*.[3] The latter are similar to copy raising verbs in that they alternate with an expletive variant:

(15) a. Tina smells/looks/sounds/feels/tastes like/as if/as though she has been baking sticky buns.

b. It smells/looks/sounds/feels/tastes like/as if/as though Tina has been baking sticky buns.

However, unlike copy raising verbs, perceptual resemblance verbs do not require a pronoun in their complement, as demonstrated by the contrast shown in (16):

(16) a. *Tina seems / appears like / as if / though Chris has been baking sticky buns.

b. Tina smells/looks/sounds/feels/tastes like/as if/as though Chris has been baking sticky buns.

Speakers sometimes find examples such as those in (15) and (16b) more difficult to get with the verb *smell*, and particularly with the verbs *feel* and *taste*. Rather than a linguistic constraint, we take this to be a problem of construal — i.e., finding an appropriate context — since we have found attested examples in both English and Swedish.[4]

Asudeh (2002, 2004) provides an analysis of copy raising that assimilates the phenomenon to resumption, as centrally exemplified by resumptive pronouns in unbounded dependencies (McCloskey 1979, 1990, 2002, Sells 1984). On Asudeh's analysis, the copy raising subject is not licensed by the copy raising verb and must instead compose in place of the copy pronoun, which is removed from semantic composition by a *manager resource* that is lexically contributed by the copy raising verb. There are three key aspects to the analysis. First, the *like/as*-complement is treated as a predicative PP complement headed by the preposition *like* or *as*, which in turn takes a clausal complement. The copy raising subject is raised from the subject of the predicative complement, thus assimilating part of the syntax of copy raising to predicative raising (*Kim seems angry*), as mentioned above. In other words, copy raising does involve standard raising on Asudeh's analysis, but it is raising from the predicative PP complement and crucially *not* from the position of the copy pronoun. The relationship between the copy raising subject and the copy pronoun is established by standard anaphoric binding, which is the second key property of the analysis. In particular, the copy raising subject binds a pronoun somewhere in the *like/as*-complement, but there is no limitation on where in the complement the pronoun can occur, unlike previous approaches which have incorrectly assumed that the copy pronoun must be the highest subject in the *like/as*-complement (see further discussion in section 5.1 below). Anaphoric binding entails that copy raising is subject to the normal locality conditions on pronouns, but is otherwise unbounded. The unbounded nature of copy raising thus stems from the general unbounded nature of anaphoric binding, but copy raising is not an unbounded dependency in the narrow sense of the term, unlike resumptive pronouns, which occur in standard unbounded dependencies such as relativization and constituent questions. Third, the copy raising verb lexically contributes a *manager resource* that removes the pronoun from composition. The compositional semantics of the copy raising verb is such that the copy raising verb composes the copy raising subject with the predicate that results from removal of the copy pronoun; the copy pronoun would otherwise have saturated the predicate. In sum, Asudeh's

[3] These verbs occur in various other usages, such as the propositional attitude use of *feel* (*I just feel that they're so uncaring*) or the intransitive use of *smells* (*This shoe smells*). Also, *look* and *sound* can be used with quite bleached meanings in which an appearance or sound is not necessarily involved. In this paper we are only concerned with the uses of these perception verbs with a *like/as*-complement and in which a sensory modality is involved.

[4] The following English and Swedish examples were found using Google:

i. Mildly reworked interior that still smells as if a cat has been stuck in there for a while.
`http://www.jsm-net.demon.co.uk/toss/toss3.html`

ii. Vinerna smakar som om man äter färska vindruvor.
wine.PL.DEF taste as if one eats fresh grape.PL
'The wines taste as if one is eating fresh grapes.'
`http://www.marzolf.fr/explication_suede.html`

approach depends on standard aspects of raising and anaphoric binding to provide an analysis of copy raising that is ultimately grounded in semantic composition. We will present further details of Asudeh's analysis in section 6.3.

Swedish has only a single true copy raising verb, *verka* ('seem'), illustrated in (17) and also in several examples above:

(17) Jessica verkar som om hon har börjat jobba redan.
J. seems as if she has started work already
'Jessica seems as if she has started working already.'

The verb *verka* is also a subject-to-subject raising verb (see (6b) above). Swedish has other raising verbs that are very similar to *verka* in many respects, but they are not copy raising verbs. These verbs are *förefalla* ('seem'), *tyckas* ('seem') and *se ut* ('look'):

(18) a. Det förefaller / tycks / ser ut som om Maria är glad.
it seems / seems / looks out as if M. is happy
'It seems / looks as if Maria is happy.'

b. Maria förefaller / ser ut att vara glad.
M. seems / looks out to be.INF happy
'Maria seems / looks to be happy'

c. Maria förefaller / tycks vara glad.
M. seems / seems be.INF happy
'Maria seems to be happy'

The verb *se ut* requires an infinitival complement introduced by *att* ('to'), the verb *tyckas* cannot take *att* and *förefalla* can take a complement with or without *att*.[5] The verbs *tyckas* and *förefalla* can only take a finite complement if the matrix subject is an expletive, as in (18a), and (19) is thus ungrammatical:

(19) * Maria förefaller / tycks som om hon är glad.
M. seems / seems as if she is happy

The verbs *förefalla* and *tyckas* are thus not copy raising verbs.[6]

The verb *se ut* also has a perceptual resemblance alternant with a finite complement. However, like in English, Swedish perceptual resemblance verbs are not true copy raising verbs, because they do not require a pronominal copy in their complement. The perceptual resemblance verbs in Swedish are thus parallel to their counterparts in English: although they can take an expletive subject, as in (20), they can also appear with a thematic subject, as in (21):

(20) Det ser ut / låter / luktar / känns / smakar som om Chris har bakat kladdkaka.
It looks out / sounds / smells / feels / tastes as if C. has baked sticky cake
'It looks / sounds / smells / feels / tastes as if Chris has baked "sticky cake".'

(21) Tina ser ut / låter / luktar / känns / smakar som om Chris har bakat kladdkaka.
T. looks out / sounds / smells / feels / tastes as if C. has baked sticky cake
'Tina looks/sounds/smells/feels/tastes as if Chris has baked "sticky cake".'

[5] The infinitival marker *att* is written the same as the complementizer *att* (see example (14)), but the two can be pronounced differently, which shows that they are separate lexical items.

[6] Some speakers do allow *tyckas* as a copy raising verb. However, most speakers reject examples like (19), and no copy raising examples with *tyckas* were found in the Parole corpus (`http://spraakbanken.gu.se/parole`).

The generalizations concerning copy raising verbs and perceptual resemblance verbs are thus parallel in English and Swedish.

Let us now summarize the main points of this section. Copy raising is a phenomenon where a raising verb that cannot take a thematic subject takes a non-expletive subject and a complement that contains an obligatory pronominal copy of the matrix subject. The copy raising verbs in English are *seem* and *appear* with *like/as*-complements. The copy raising verb in Swedish is *verka* ('seem') with a *som*-complement. Copy raising verbs must be distinguished from perceptual resemblance verbs, which may take a thematic subject.

3 Two puzzles

This section introduces two empirical puzzles whose solutions do not follow immediately from what is already known about copy raising. The first generalization has to do with the interpretation of copy raising sentences and leads to what we call *the puzzle of the absent cook*. This puzzle arises in both English and Swedish. The second set of data concerns a PP adjunct that occurs in Swedish, but not English. The PP in question is headed by the preposition *på* and it gives rise to a puzzle that we call *the* på *puzzle*: a *på*-PP cannot be used in a copy raising sentence.

In section 4, which presents our analysis informally, we show that the two puzzles are connected, both having to do with the source of perceptual information in perceptual reports. The subject of a copy raising sentence is interpreted as the source of perception and so is the NP complement of a *på*-PP. Perceptual sources are reminiscent of thematic roles, but we argue in section 5 that the two notions are ultimately different and that perceptual sources are not thematic roles. Our analysis is formalized in section 6.

3.1 The puzzle of the absent cook

There is a contrast between the true copy raising subcategorization of the verbs *seem/appear* and *verka* and their other, ordinary raising subcategorizations. This contrast is surprising under the standard assumption that raising verbs have a non-thematic subject and a single, propositional argument and under the theoretically conservative auxiliary assumption that copy raising verbs are unexceptional raising verbs in this regard.

Consider the following context:

(22) A and B walk into Tom's kitchen. Tom is at the stove doing something, but exactly what is a little unclear.

In this context, the following statements by A to B are all felicitous:

(23) a. i. Tom seems to be cooking.
ii. Tom verkar laga mat.
T. seems make.INF food
b. It seems that Tom is cooking.

(24) a. i. Tom seems like he's cooking.
ii. Tom verkar som om han lagar mat.
T. seems as if he makes food
'Tom seems as if he's cooking.'
b. i. It seems like Tom's cooking.
ii. Det verkar som om Tom lagar mat.
it seems as if T. makes food
'It seems as if Tom's cooking.'

Now consider the following alternative context:

(25) A and B walk into Tom's kitchen. There's no sign of Tom, but there are various things bubbling away on the stove and there are several ingredients on the counter, apparently waiting to be used.

Given this context, (23a), (23b), and (24b) are still felicitous, but (24ai-ii), repeated here, are now infelicitous:

(26) a. #Tom seems like he's cooking.

b. # Tom verkar som om han lagar mat.
T. seems as if he makes food
'Tom seems as if he's cooking.'

If *Tom* is not a thematic subject of *seem/appear/verka*, why are these sentences not felicitous like the infinitival versions? We call this *the puzzle of the absent cook*.

3.2 The *på* puzzle

According to the data that has been presented so far, the Swedish verb *verka* is exactly parallel to English *seem*. In examples (27–29), the Swedish sentences correspond closely to the English translations. Example (30) is ungrammatical, as is its English equivalent.

(27) Det verkar som om Tom har vunnit.
it seems as if T. has won
'It seems as if Tom has won.'

(28) Tom verkar ha vunnit.
T. seems have.INF won
'Tom seems to have won.'

(29) Tom verkar som om han har vunnit.
T. seems as if he has won
'Tom seems as if he has won.'

(30) * Tom verkar som om Kalle har vunnit.
T. seems as if K. has won

Examples shown in previous sections and examples (27–30) demonstrate the close similarity between *seem* and *verka*.

However, Swedish *verka* allows a type of expression that is not available in English:

(31) Det verkar på Tom som om han har vunnit.
it seems on T. as if he has won
∼'Tom gives the impression that he has won.'

The *på*-PP specifies that the impression that the referent of the pronoun *han* (i.e., Tom or someone else) has won originates with Tom. It is not specified how Tom gives off this impression: it could be the way he looks or acts, it could be something he said, or it could be something else. The verb *verka* thus allows for a *på*-PP which specifies

the *source* of perception, which we will call the PSOURCE.[7] This PP is an adjunct and not an argument, as will be discussed in more detail in section 5.

Examples with på-PPs do not require copy pronouns in their complements, as shown by the following variant of (31):

(32) Det verkar på Tom som om Kalle har vunnit.
it seems on T. as if K. has won
∼ 'Tom gives the impression that Kalle has won.'

The *på*-PP can be contrasted with the English *to*-PP, which specifies the *goal* of perception (PGOAL; i.e., the perceiver):

(33) It seemed to Tom as if Kalle had won.

The verbs *verka* and *tyckas* can take a plain NP object with the same interpretation as the English *to*-PP, as exemplified in (34–35).

(34) % Det verkade mig som om Tom hade vunnit.
it seemed me as if T. had won
'It seemed to me as if Tom had won.'

(35) Det tycktes mig som om Tom hade vunnit.
it seemed me as if T. had won
'It seemed to me as if Tom had won.'

The PP *to Tom* in (33) and the goal NP in (34–35) do not have the same interpretation as *på Tom* in (31). In (31), there is something about Tom that makes it seem as if he has won. Examples (33–35), on the other hand, leave unspecified what gives off the impression that Tom has won, but rather express to whom the impression has been given.[8]

Let us now return to copy raising, which is surprisingly not compatible with *på*-PPs. Compare (29) above, repeated here as (36), to (37):

(36) Tom verkar som om han har vunnit.
T. seems as if he has won
'Tom seems as if he has won.'

(37) * Tom verkar på Lisa som om han har vunnit.
T. seems on L. as if he has won

The ungrammaticality of (37) is unexpected, as copy raising sentences like (36) are generally considered to be equivalent to expletive sentences like (38),[9] which are grammatical with *på*-PPs, as shown in (39):

[7] Note that the PSOURCE *på*-PP is different from *from*-PPs in examples like the following: *It appears from literature that the seriousness of the societal consequences of an incident is judged to increase with the square of the number of people killed* (example taken from Biber et al. 1999: 733). The *from*-PP gives the source of information and is similar to the *på*-PP. However, the two are nevertheless different, as the following is unacceptable: **It appears from Tom as if he has won.* We simply note here that the two cannot be conflated and leave a full analysis of the English *from*-PP to future research.

[8] A note on the Swedish data: The Swedish goal NP illustrated in (34–35) does not appear to be as commonly used as the English *to*-PP. Many speakers find (34) unacceptable. Example (35) is more generally accepted, although some find it quite formal. In contrast, the *på*-PP is not marginal or particularly formal.

[9] See the literature on copy raising referred to above, and see also Teleman et al. (1999: vol. 4, p.56).

(38) Det verkar som om Tom har vunnit.
it seems as if T. has won
'It seems as if Tom has won.'

(39) Det verkar på Lisa som om Tom har vunnit.
it seems on L. as if T. has won
∼'Lisa gives the impression that Tom has won.'

Why should the PP adjunct be excluded in (37), although it can be included in (39)? This is our second puzzle, which we call *the* på *puzzle*. It is easy to understand what the intended meaning of (37) is: it is the same as that of (39). Yet the example is ungrammatical. Example (37) can be contrasted with (40), which contains a *to*-PP, and Swedish (41–42), which contain plain NP objects comparable to the English *to*-NP:[10]

(40) Tom seemed to me as if he had won.

(41) % Tom verkade mig som om han hade vunnit.
T. seemed me as if he had won
'Tom seemed to me as if he had won.'

(42) Tom tycktes mig ha vunnit.
T. seemed me have.INF won
'Tom seemed to me to have won.'

The PP *to me* in (40) and the NP *mig* in (41–42) denote a perceptual goal (the perceiver), not a perceptual source. Comparing examples (40–41) to (37), we see that PGOALs are compatible with copy raising, but PSOURCE PPs are not.

We propose that the *på* puzzle and the puzzle of the absent cook are connected. The essence of our proposal is as follows. Both puzzles arise due to the linguistic expression of perceptual reports. The examples that led to the puzzle of the absent cook are odd because the subject of the copy raising verb is interpreted as the source of perception when it is unavailable to offer perceptual evidence. The examples that led to the *på* puzzle are ungrammatical because two distinct linguistic expressions simultaneously specify the source of perception.

4 Copy raising and perceptual reports: An outline of the analysis

We present our formal analysis in section 6, but let us first further spell out our proposal in general terms. In copy raising sentences, the subject of the copy raising verb is interpreted as the source of perception (PSOURCE). This is why (43) and its Swedish equivalent (44) are both odd in a context where the speaker does not have perceptual evidence of Tom, as discussed in section 3.1:

> A and B walk into Tom's kitchen. There's no sign of Tom, but there are various things bubbling away on the stove and there are several ingredients on the counter, apparently waiting to be used.

(43) #Tom seems like he's cooking.

(44) # Tom verkar som om han lagar mat.
T. seems as if he makes food
'Tom seems as if he's cooking.'

[10] Example (42) is a raising example instead of a copy raising example, since *tyckas* is not a copy raising verb.

Examples (43) and (44) can be paraphrased as follows: It seems like Tom is cooking and what gives this impression is Tom himself.[11] The example is thus not felicitous in a situation where Tom is not available to be the source of the report. Swedish and English are equivalent with respect to the interpretation of copy raising, and so (44) is equally odd in the given context.

Copy raising is thus different from standard raising in that there is a crucial difference in interpretation between the expletive version and the non-expletive version. Compare the raising alternation in (45) to the copy raising alternation in (46):

(45) a. Tom seems to be the smartest guy in the world.

b. It seems that Tom is the smartest guy in the world.

(46) a. Tom seems like he's the smartest guy in the world.

b. It seems like Tom is the smartest guy in the world.

Whereas the two examples in (45) have the same interpretation (Rosenbaum 1967, Postal 1974), the two examples in (46) differ. In (46a), Tom is necessarily interpreted as the source of perception. In (46b), and also in the examples in (45), the source of perception is not overtly specified, but rather existentially closed. We return to the status of the PSOURCE in examples like (45a–b) and (46b) in section 6.4.3.2.

We contend that the verbs *seem* and *appear* and their Swedish counterpart *verka* entail a source of perception, but that this source is not connected to an argument or thematic role. Rather, we analyze PSOURCEs (and PGOALs) as entailed participants in the states that these verbs denote. Thus, the subject *Henrika* is not a *thematic* subject of *seem* in (47):

(47) Henrika seems like she's had enough.

There are thus parallels between perceptual sources/goals and temporal and locative modifiers of eventualities, where we understand the term *eventuality* to be a cover term for events and states (Bach 1981). Eventualities in general entail a time and location, yet these entailments are only sometimes overtly realized. In sum, the solution to the puzzle of the absent cook is that a non-expletive copy-raised subject is interpreted as the PSOURCE — the source of perception — and ascribing the role of PSOURCE to the subject is infelicitous if the individual in question is not perceivable as the source of the report. We justify the non-argument, non-thematic role status of PSOURCEs (and PGOALs) in section 5.

Since we treat the Swedish *på*-PP as contributing a PSOURCE, our analysis treats (48) as synonymous to (44), if *Tom* and *han* are understood co-referentially:

(48) Det verkar på Tom som om han lagar mat.
It seems on T. as if he makes food
'Tom seems as if he's cooking.'

[11] Rogers (1973: 77) makes a similar claim when he notes that (i) 'presupposes' (ii):

i. Charley looked to me like he goosed Francine.

ii. I saw Charley.

Rogers gives corresponding examples for all the perceptual resemblance verbs, but does not discuss copy raising verbs.

It should be noted that we treat the relationship between (i) and (ii) as an entailment that the copy raised subject *Charley* is the PSOURCE, not a presupposition. The implication that the copy raised subject is the PSOURCE fails the standard projection tests for presupposition (see Beaver 2001 for an overview). For example, (iii) no longer implies (ii).

iii. If Charley looked to me like he goosed Francine, I would have told her so.

However, our analysis does treat absent cook scenarios as involving a kind of presupposition failure, due to an incompatibility between the actual PSOURCE and the asserted PSOURCE; see section 6.4.3. We return to perceptual resemblance verbs in section 6.5.

Given our solution to the puzzle of the absent cook, this predicts that (48) is infelicitous in the same contexts as (44). This prediction is correct. For example, in the scenario where Tom is absent but the kitchen shows signs of cooking, (48) cannot be felicitously uttered.

Let us now turn to puzzle number two, the *på* puzzle, which concerned the ungrammaticality of examples like the following:

(49) * Maria verkar på Per som om hon är glad.
M. seems on P. as if she is happy

In (49), both Maria and Per are specified as the source of perception, and the example is ungrammatical.

Now the question is: Why can't two PSOURCEs be specified? The restriction cannot be due to the state of the world or our knowledge of it. It is after all possible to report that Maria gives the impression that Per gives the impression that she is happy or that Maria and Per together give the impression that she is happy. However, (49) cannot express either of these propositions. We therefore conclude that there is a linguistic constraint against expressing multiple perceptual sources. This constraint can be understood as a generalization of the notion that eventualities have at most one instance of each thematic role (Carlson 1984, Chierchia 1984, 1989, Dowty 1989, Parsons 1990, Landman 2000). Carlson (1984: 271) similarly argues that this is a linguistic restriction and cannot be simply due to "the nature of the world itself". It is conceivable to imagine events which involve multiple themes, for example, but no verbs denote such events. Just as a verb cannot have more than one theme, a verb cannot have more than one perceptual source. Landman (2000: 38) proposes the following principle for thematic roles:

(50) **Unique Role Requirement**
If a thematic role is specified for an event, it is uniquely specified.

Following Chierchia (1984, 1989), Landman (2000: 44) captures this requirement formally by defining thematic roles as partial functions from eventualities to individuals. PSOURCEs are not thematic roles on our analysis, but we can extend the uniqueness requirement to PSOURCEs by similarly defining them as partial functions on eventualities. The codomain of the PSOURCE function is, however, not the set of individuals, but rather the union of the set of individuals and the set of eventualities. In this respect, the PSOURCE function is unlike most thematic roles, which can only be filled by individuals, but is like the thematic role STIMULUS, to which it bears a clear relationship. Eventualities can fill the stimulus role in event semantics analyses of bare infinitival complements to perception verbs (Parsons 1990: 140), as in (51):

(51) Tina saw Fred laugh.

Although PSOURCE bear similarities to STIMULUS, we have chosen a different label to signal that a PSOURCE is not a thematic role assigned to a semantic argument. PGOAL is similarly comparable to the thematic role EXPERIENCER, but is not necessarily tied to an argument either. The status of PSOURCE and PGOAL is investigated in detail in section 5.

5 The status of PSOURCE and PGOAL

In the previous section, we claimed that PSOURCEs are not arguments or thematic roles, but are nevertheless participants in eventualities. We will use the term *semantic role* for such participants. This term is used somewhat variably in the literature (see, e.g., Pollard and Sag 1994 and Payne 1997), but we intend it specifically as a generalized notion of thematic role which subsumes Parsons's thematic relations (Parsons 1990, 1995). We motivate our theory of semantic roles by considering copy raising subjects from the perspective of thematic theory. This literature is vast and rich, so we will particularly look at two representative positions on thematic roles. The first is the Theta Criterion of Principles

and Parameters Theory (P&P; Chomsky 1981, 1986, 1995), which posits a tight relationship between arguments and thematic roles. The second is event semantics, for which we take the work of Parsons (1990, 1995) as a representative case. Parsons's theory treats thematic roles quite differently from the Theta Criterion. What is particularly relevant here is that it posits a much looser relationship between arguments and thematic roles.

We argue in section 5.1 that the semantic roles PSOURCE and PGOAL are not arguments and therefore cannot be thematic roles in the sense of the Theta Criterion. We then turn to Parsons's Neo-Davidsonian theory of thematic relations in section 5.2. We show that Parsons's (1995) theory could in principle accommodate the PSOURCE and PGOAL roles themselves. However, we note that other aspects of the semantics of copy raising verbs and perceptual resemblance verbs pose problems for the theory. We show that this is part of a more general problem for Parsons (1995) in dealing with the semantics of raising. In section 5.3, we present our view of semantic roles, which avoids the problems in question while yielding a new perspective on thematic information. The theory is a synthesis of Davidsonian and Neo-Davidsonian event semantics, based on aspects of Chierchia (1984), Dowty (1989), and Parsons (1990, 1995).

5.1 The Theta Criterion

The Theta Criterion of Principles and Parameters Theory has two parts (Chomsky 1981: 36):[12]

(52) **Theta Criterion**

1. Each argument bears one and only one θ-role.
2. Each θ-role is assigned to one and only one argument.

The Theta Criterion has been subsumed under the Principle of Full Interpretation (FI) in the more recent Minimalist Program tradition of P&P (Chomsky 1993: 32, Chomsky 1995: 200), but it is clear that it is still generally understood in the same way and it continues to be a topic of work in the Minimalist Program after its subsumption to FI. Some of this work argues for adjusting the first clause of the Theta Criterion such that each argument has to have at least one θ-role, thus allowing multiple theta roles to be assigned to a single argument (Hornstein 1999, Brody 1993, Boškovič 1994). It is in any case the second clause of the Criterion that is relevant here.

The second clause of the Theta Criterion states that θ-roles are assigned to arguments. It is then possible to show that PSOURCE is not a thematic role in the sense of the Theta Criterion — a θ-role — by showing that bearers of the PSOURCE semantic role are not arguments. We first make the case for Swedish by showing that the *på*-PP that realizes the PSOURCE is an adjunct, not an argument. We then turn our attention to English. We argue that the crucial distinction between true copy raising verbs and perceptual resemblance verbs — the former require a copy pronoun whereas the latter do not — is best understood on the assumption that non-expletive copy raising subjects are not arguments. We strengthen our argument by demonstrating empirical and theoretical shortcomings of proposals in the literature that copy raising verbs can optionally take thematic subjects (Potsdam and Runner 2001, Fujii 2005).

The Swedish *på*-PP in copy raising sentences is an adjunct, not an argument, according to evidence from deletion and extraction. Consider the following two examples, the first of which contains a PSOURCE *på*-PP and the second of which contains an oblique argument in a PP headed by *på*:

(53) Det verkade på Jenny som om hon var lite tokig.
it seemed on J. as if she was little crazy
'Jenny seemed as if she was a little crazy.'

[12] Chomsky (1986: 135) subsequently revised the Theta Criterion to apply to CHAINS, but we use the slightly simpler original version, since the revision is not relevant to the point at hand.

(54) Petra såg på Jenny som om hon var lite tokig.
P. looked on J. as if she was little crazy
'Petra looked at Jenny as if she was a little crazy.'

The PP in (53) can trivially be left out, as in (55). Example (55) does not specify the PSOURCE, but it is fully grammatical without the PP. The PP in (54), however, is obligatory, and excluding it renders the example ungrammatical, as shown in (56).

(55) Det verkade som om hon var lite tokig.
it seemed as if she was little crazy
'It seemed as if she was a little crazy.'

(56) * Petra såg som om hon var lite tokig.
P. looked as if she was little crazy

Adjuncts are generally optional and arguments are not, so the contrast shown in (55–56) is explained under the assumption that the *på*-PP in (53) is an adjunct whereas the *på*-PP in (54) is an argument.

Further evidence for the adjunct status of the PSOURCE *på*-PP comes from extraction: the NP-complement of the PSOURCE PP in (53) cannot be extracted, but the NP-complement of the oblique PP in (54) can.

(57) * Vem verkade det på som om hon var lite tokig?
who seemed it on as if she was little crazy

(58) Vem såg Petra på som som hon var lite tokig?
who looked P. on as if she was little crazy
'Who did Petra look at as if she was a little crazy?'

It is generally possible to extract out of arguments but it is much harder to extract out of adjuncts, so (57) provides another piece of evidence that the PSOURCE PP of *verka* is an adjunct. It may be argued that (57) is difficult to parse on the intended reading because it brings to mind an alternative meaning of the verb *verka*, which can also mean 'to affect'. However, (59) is equally ungrammatical (note that *lät* is the past tense form of the perceptual resemblance verb *låta*):

(59) * Vilken högtalare lät det på som om skivspelaren var sönder?
which speaker sounded it on as if record.player.DEF was broken

(60) Det lät på högra högtalaren som om skivspelaren var sönder.
it sounded on right speaker.DEF as if record.player.DEF was broken
'The right speaker sounded as if the record player was broken.'

Example (59) corresponds to (60), which contains a PSOURCE *på*-PP. Again, the fact that extraction out of the PSOURCE PP is not possible is evidence that the PP is an adjunct. In sum, evidence from deletion and extraction points to an adjunct status for the Swedish PSOURCE *på*-PP. Since the *på*-PP that realizes the PSOURCE semantic role in Swedish is not an argument, it follows that PSOURCE cannot be a θ-role according to the standard conception of the Theta Criterion.

The evidence for the status of PSOURCE in English is necessarily different, because the question crucially concerns the status of the subjects of copy raising verbs and these cannot be syntactic adjuncts. The question here is instead

whether the copy raising subject is a thematic argument of the raising verb, which would be unusual given the normal analysis of raising verbs. Potsdam and Runner (2001) apply traditional argumenthood tests to the English copy raising verbs, and we review these tests here. First, copy raising examples alternate with expletive examples:

(61) a. Sarah appears as if she will win again.

b. It appears as if Sarah will win again.

The expletive alternant shows that copy raising verbs can take a single (clausal) argument.

Second, copy raising verbs can actually raise expletives. This is shown in example (62), where it is clear that the expletive in (62) has raised from the lower clause, since *seems* cannot normally take *there* as an expletive subject, taking an *it* expletive instead:

(62) %There seems like there's a lot of garbage in the driveway.

(63) *There seems like a lot of garbage is in the driveway.

(64) It seems like a lot of garbage is in the driveway.

As an expletive cannot be associated with a thematic role, the ability of a copy raising verb to take *there* shows that the verb does not necessarily assign a thematic role to its subject. Copy raising verbs can raise even an expletive to fill the subject position.

Third, idiom chunks can similarly be raised:

(65) a. %The cat seems like it is out of the bag.

b. %The shit seemed like it hit the fan.

Like expletives, idiom chunks such as *the cat* or *the shit* in (65) are not associated with thematic roles. Although we do not seek to explain the capacity of these verbs to copy-raise *there*-expletives and idiom chunks (see Asudeh 2004 for one possible explanation), the data listed above provide strong evidence that copy raising verbs have non-thematic subjects.

However, the argumentation is weakened by the fact that perceptual resemblance verbs can also appear in examples with expletives and raised expletives and idiom chunks (Rogers 1973: 82–83):

(66) It looks like Sarah might win again.

(67) %There looks like there's a lot of garbage in the driveway.

(68) %The cat looks like it is out of the bag.

Recall from above that we argue, following Asudeh (2002, 2004), that perceptual resemblance verbs are in fact not copy raising verbs because of the contrast illustrated in (69):

(69) a. John looks like the party ended early.

b. *John seems like the party ended early.

Example (69a) shows that, unlike true copy raising, *look* does not obligatorily require a copy pronoun in its finite complement. In (69a), *look* has a thematic use; *John* is a semantic and syntactic argument of *look*.[13] Since *look* allows but does not require a thematic subject, we follow Rogers (1973) and Potsdam and Runner (2001) and treat it

[13]This is a slight simplification: the subject in (69a) is not directly a semantic argument of *look*, but is rather an argument of a function that *look* takes as an argument; see section 6.5.

as optionally thematic. In other words, perceptual resemblance verbs are treated as ambiguous, having both raising and non-raising variants. The necessity of a copy pronoun for copy raising verbs follows if their subject is a non-thematic argument that is only licensed through its relationship to the copy pronoun. One possible realization of such an analysis is Asudeh's (2004) treatment of the licensing relationship as a matter of semantic composition: the copy pronoun is removed from composition and the subject is composed in its place, thus treating copy raising as a kind of generalized resumption. In contrast, perceptual resemblance verbs do not perform this kind of composition with their subjects.

We have concluded that *look* and other perceptual resemblance verbs have optionally thematic subjects. We have also argued that copy-raising subjects are associated with the semantic role PSOURCE. One could then envisage an analysis where the copy raising verbs *seem* and *appear* also have optionally thematic subjects. When the subject is thematic, it has a θ-role, what we have called the semantic role PSOURCE. The claim that copy raising subjects can be thematic has in fact been made in the literature: Potsdam and Runner (2001) and Fujii (2005) propose that a non-expletive copy raising subject is sometimes thematic. Matushansky (2002: 221) proposes that such subjects are always thematic, butMatushansky is not primarily concerned with copy raising and does not argue her position, so we will concentrate on Potsdam and Runner's and Fujii's claims.

Potsdam and Runner (2001: 456–458) state that a copy raising subject is thematic in cases where the copy pronoun in the complement is in non-subject position (Potsdam and Runner 2001):

(70) a. Bill sounds like Martha hit him over the head with the record. (adapted from Rogers 1973: 97)

b. Ermintrude looks like the cat got her tongue. (Rogers 1971: 219, (51))

c. Mary appears as if her job is going well.

This data is partly problematic, since Potsdam and Runner (2001), like most work on English copy raising (e.g., Rogers 1971, 1973, 1974, Heycock 1994), do not distinguish between copy raising verbs and perceptual resemblance verbs. We have already seen that the perception verbs do not require a pronoun in their complement at all. It is therefore irrelevant whether any pronoun that happens to occur in the complement is a subject or not. However, the third example in (70) is an instance of the copy raising verb *appear*. On Potsdam and Runner's theory, it is necessary for examples like (70c) to have an explanation outside their analysis of copy raising, because their analysis crucially predicts that copy raising is only possible from the highest subject position in the *like/as*-complement. The copy pronoun in (70c) is not itself the highest subject, but is rather contained within that subject.

It is possible to construct copy raising examples in which the copy pronoun is embedded yet deeper:

(71) a. Richard seems like the judges have finally announced that he won. (Asudeh 2004: 383)

b. Richard seemed like the judges had decided to support Mary's complaint that he cheated.

c. Richard seemed like the judges had decided to support his complaint that Mary cheated.

d. Richard seemed like the judges had decided to disqualify him.

e. Richard seems like the judges have finally declared him the winner.

In these examples, the copy pronoun is a deeply embedded subject (71a–71b), an embedded possessor (71c), an embedded object (71d), or inside an embedded small clause (71e).

Attested examples of with non-subject ponouns can also readily be found:

(72) a. He seemed like she could tell him things she couldn't even tell her sister.
(Takesha Powell. *The Goode Sisters*. Lincoln, NE: Writer's Club Press. 2002)
`http://books.google.com/`; checked 31/05/2007

b. I have begged him to take me out to dinner at least once a month, but he seems like I'm asking him to sacrifice his first born.
(Fannie Harris. *TC: L.O.T. (The Commitment: Love on Trial)*. West Conshohocken, PA: Infinity Publishing. 2005)
`http://books.google.com/`; checked 31/05/2007

c. She seemed like I was offending her by calling.
`http://www.google.com`; checked 31/05/2007

In sum, there is a class of apparent copy raising examples in which the copy pronoun is not the highest subject of the *like/as*-complement and Potsdam and Runner's theory must treat all of these as instances of copy raising with a thematic subject.

Fujii (2005) follows Potsdam and Runner (2001) in separating copy raising into two types, one with a non-thematic subject and the other with a thematic subject. As in Potsdam and Runner's analysis, the copy raised subject is non-thematic only if the copy pronoun occurs as the highest subject in the *like/as*-complement; if the copy pronoun occurs in any other position, the copy raising subject is assumed to be thematic. Fujii (2005: 46) presents new evidence for this treatment. He notes that *picture-NPs* as copy raising subjects only allow reconstruction for binding if the copy pronoun is in the highest subject position in the finite clause complement to *like/as if/as though* (Fujii 2005: 46, (18),(20)):

(73) a. [Stories about each other$_i$]$_j$ seem like [they$_j$ have frightened John and Mary$_i$]

b. *[Stories about each other$_i$]$_j$ seem like John and Mary$_i$ like them$_j$

(74) a. [Pictures of his$_i$ mother]$_j$ seem as if [they$_j$ will make every boy$_i$ aggravated]

b. *[Rumours about his$_i$ mother]$_j$ seem as if Bill expects them$_j$ to make every boy$_i$ aggravated

Fujii (2005: 45–46) assumes an independently motivated analysis of psych verbs in which the surface subject of the psych verb originates as its complement. Based on this, the contrasts between the (a) and (b) examples are explained if the copy raising mechanism is long-distance A-movement from the highest subject in the *like/as*-complement to the subject. The picture-NP originates as the complement of the psych predicate, where it is in a position for the anaphor in (73a) to be properly bound or for the pronoun in (74a) to be a variable bound by the quantifier. It then moves to become the subject of the psych verb and is lastly copy raised from that position by long A-movement to matrix subject postion. The binding contrast is explained on the assumption that the movement chain allows reconstruction of the picture-NP in its base position.

We acknowledge the contrast between the (a) and (b) examples above, but it cannot be due to reconstruction. If reconstruction were responsible, we would equally expect it to occur in the following:

(75) *[Stories in each other's$_i$ collections]$_j$ seem like [they$_j$ have frightened John and Mary$_i$]

(76) *[Masks worn by his$_i$ mother]$_j$ seem as if [they$_j$ will make every boy$_i$ uneasy]

(77) *[The cakes at her$_i$ party]$_j$ seemed like [they$_j$ pleased every girl$_i$]

The Swedish possessive reflexive *sin* provides further evidence for lack of reconstruction in copy raising:

(78) * [Sitt$_i$ kalas]$_j$ verkade som om [det$_j$ gladde varje flicka$_i$]
POSS.REFL. party seemed as if it pleased every girl

(79) * [Gåvorna på sin_i födelsdag]$_j$ verkar som om [de_j gjorde varje pojke_i besviken]
presents on POSS.REFL. birthday seem as if they made every boy disappointed

The constrasts that Fujii notes in (73) and (74) therefore cannot be due to reconstruction and do not establish long A-movement as the mechanism for copy raising. Long A-movement with reconstruction incorrectly predicts that (75–79) should be grammatical. The arguments against long A-movement also cast doubt on the recent proposal by Polinsky and Potsdam (2006: 18) that "licit A-movement out of the complement clause" is a condition on copy raising. In sum, Fujii (2005) fails to motivate separation of copy raising into two types, one with a non-thematic subject and the other with a thematic subject. A likelier explanation for Fujii's contrasts might rest on the logophoricity of pronominals in picture-NPs (Kuno 1987, Reinhart and Reuland 1991, 1993, Pollard and Sag 1992).

We have argued that Potsdam and Runner (2001) and Fujii (2005) have not established that copy raising verbs can have thematic subjects. Independently of their results, there are two serious problems with the postulation of thematic copy raising. The first is a theoretical problem. It is generally assumed that the raising verbs *seem* and *appear* denote one-place functions on propositions (whatever seems or appears to be the case). This central assumption explains a number of properties of these raising verbs, such as their ability to take expletive subjects, their preservation of meaning under passivization of the complement, and their very ability to raise the subject of the complement to a matrix position. The claim that there are instances of *seem* and *appear* with thematic subjects entails that the standard semantics for these verbs is wrong and that the verbs at least sometimes denote a relation between individuals and propositions. In other words, a key theoretical problem with the claim that a copy raising subject can be thematic is that it no longer maintains the standard semantics for raising and therefore undermines the results that stem from such a semantics. In the absence of independent evidence to the contrary, an analysis that does not posit such a radical departure in the semantics of these verbs is thus preferable. Such an analysis would also be favoured by Ockham's razor over an analysis that posits a thematic ambiguity in the raising verbs *seem* and *appear*.

The second problem with the claim in question is empirical. Such a position erroneously predicts the possibility of copy raising with no copy pronoun whatsoever. If the copy raising subject can be thematic, we expect the pattern of data in copy raising to match the data for perceptual resemblance verbs, which do have thematic subjects under one alternant. Potsdam and Runner (2001: 457–458) cite Heycock (1994) for well-formed examples of copy raising without copy pronouns, but these all involve perceptual resemblance verbs. Copy raising verbs, as we noted above, are in fact generally ungrammatical without copy pronouns. We have encountered certain speakers who accept some instances of copy raising without any copy pronoun. For these speakers, a thematic analysis may be desirable; copy raising *seem* likely means to them something more like perceptual resemblance *look*. However, there are speakers — the vast majority of our informants — who reject copy raising without a copy pronoun, although they accept examples where the complement contains a pronominal copy that is not necessarily a subject. This pattern of data would be completely unexpected if these speakers had a thematic use of copy raising verbs. We therefore conclude, following Asudeh (2002, 2004), that copy raising subjects are non-thematic and our formal analysis, in section 6, reflects this.

To sum up, neither the PSOURCE *på*-PP nor the copy raising subject are thematic arguments in the sense of the Theta Criterion. The *på*-PP is an adjunct, not an argument. The copy raising subject is non-thematic: the sole argument of *seem* and *appear* is a predicative or clausal complement.

5.2 Thematic relations

A semantic role in our sense is a one-place function on eventualities whose range is either the set of individuals or the union of the set of individuals and eventualities, depending on the role in question. This is clearly quite similar to Parsons's (1990, 1995) conception of *thematic relations*, which are relations between events/states and individuals

(Parsons 1995: 638–639).[14] Although Parsons's theory could accommodate PSOURCE and PGOAL in principle, they introduce certain complications. More importantly, the theory has more extensive problems with copy raising and perceptual resemblance, which reflects its general problem with the semantics of raising.

Parsons (1995: 638–640) seeks to steer clear of certain problems in the specification of thematic roles by avoiding substantive analysis of thematic roles in favour of definitions that crucially rely on the use of prepositions and other relations (e.g. 'experiences') to define the thematic relation in question. For example, the core relations Agent and Theme are defined as follows:

(80) Agent: 'x is the Agent of event e iff e is *by* x'

(81) Theme: 'x is the Theme of event e iff e is *of* x'

A concrete example further illustrates how this works:

(82) Brutus stabbed Caesar.

Brutus is the Agent of the stabbing iff the stabbing is by Brutus.
The stabbing is by Brutus.
Therefore, Brutus is the Agent.

Caesar is the Theme of the stabbing iff the stabbing is of Caesar.
The stabbing is of Caesar.
Therefore, Caesar is the Theme.

These sorts of definitions work for the cases that Parsons (1995) addresses and the general strategy of relating thematic relations to prepositions and other basic relations is promising, because it relies on our linguistic intuitions about other simpler meanings to anchor thematic relations, rather than attempting to provide substantive specifications of thematic relations that invariably fail to match our intuitions in some cases (Dowty 1989, Parsons 1995: 638,640–641).

Parsons's theory could potentially accommodate PSOURCE and PGOAL with the relational definitions in (83). Note that although Parsons's definitions mention only events, we rely on the more generalized concept of 'eventuality' (Bach 1981), which covers both events and states; this generalization is necessary because the raising and perception verbs of interest here are stative, not eventive.

(83) a. Psource: 'x is the Psource of an eventuality e iff e is perceivable from x'

b. Pgoal: 'x is the Pgoal of an eventuality e iff is e perceivable to x'

These relational definitions are within the spirit of Parsons's approach. Furthermore, they plainly relate the relations Psource and Pgoal to the standard thematic relations Source and Goal, because the latter are defined by the prepositional relations 'from' and 'to', and here we have 'perceivable from' and 'perceivable to', which apparently add just the extra required dimension of perception. Subsumption of PSOURCE and PGOAL in Parsons's theory of thematic relations thus shows initial promise.

A complication arises, though, when we consider how the Parsonian Psource and Pgoal could be used in syllogisms like (82). Consider the following attempt:

(84) Tom seems to Lisa like he is tired.

Tom is the Psource of the seeming iff the seeming is perceivable from Tom.

[14] In fact, given the discussion of perception verbs such as *see* in Parsons (1990), it is clear that Parsons would also countenance thematic relations as relations between events precisely for cases that are related to the kind that we examine in this paper. For example the Theme relation in his logical form for *Mary saw Brutus stab Caesar* is Theme(e′,e), where e' is the seeing event and e is the stabbing event (Parsons 1990: 140).

The seeming is perceivable from Tom.
Therefore, Tom is the Psource.

Lisa is the Pgoal of the seeming iff the seeming is perceivable to Lisa.
The seeming is perceivable to Lisa.
Therefore, Lisa is the Pgoal.

Although Parsons (1995) is willing to countenance some degree of ill-formedness of wording in application of his definitions,[15] the syllogisms in (84) stretch the bounds of credulity. And the problem runs deeper than just the ill-formedness of the nominalization 'seeming'. The real issue is that the assertions that the 'seeming is perceivable from Tom' and that the 'seeming is perceivable to Lisa' do not correctly capture the underlying concept of what it means for someone or something to seem a certain way. As a result, the Parsonian approach in this instance fails to properly anchor the meanings of these thematic relations in simpler linguistic meanings.

This problem reflects a deeper problem for the Parsonian approach with the semantics of copy raising verbs and perceptual resemblance verbs. Part of the problem has to do with the inability of the treatment of stative verbs in Parsons (1995: 643–644) to be extended to these verbs. Parsons only briefly considers stative verbs, namely predicative *be* and the "noncausative transitive stative verb" *believe*. His main concern is to establish that one can profitably use a relation of "In-ness" to analyze such cases and to establish that the complement of transitives like *believe* can be assigned the role Theme, because they fit the *of* definition. For example, he analyzes example (85) as in (86) (Parsons 1995: 644):

(85) Mary believes what John said.

(86) (∃s)[s is a state of believing & In(Mary,s) & Theme(s,what John said)]

Parsons (1995: 644) notes that, "What John said is the Theme, because one can say that the believing is *of* what John said" (emphasis in original).

One problem that is encountered in extending this semantics to raising and perceptual resemblance verbs has to do with the 'In-ness' relation. The use of the 'In-ness' relation for *seem* would have to mean something quite different from its use with, e.g., *believe*. Mary can be in a state of belief with respect to X regardless of anyone else's perceptions of the matter. However, being in a state of seeming makes no sense in the absence of another's perceptions. The same comment applies to the perceptual resemblance verbs. Mary can only seem, look, smell, etc., a certain way *to* an observer. Another way of looking at this is that under normal circumstances what Mary believes is up to her, but how she seems is not up to her.

A more serious problem has to do with the status of the conjuncts in Parsons's Neo-Davidsonian logical forms for verbs, which he calls an "independent conjunct analysis" (Parsons 1990: 94). In this sort of representation, already encountered in (86), the verbal predicate has a single argument, the event or state, and all other arguments and adjuncts are part of a conjunction that contains the verbal predicate. For example, the logical form for (87) is (88) (Parsons 1995: 94):

(87) Brutus stabbed Caesar with the knife.

(88) (∃e)[Stabbing(e) & Agent(e,Brutus) & Theme(e,Caesar) & With(e,knife)]

[15] Parsons's true criterion for definition of a thematic relation with a preposition is not as strict as syntactic and semantic well-formedness of the paraphrase, as the following passage makes clear (Parsons 1995: 639):

> [W]e worried above about whether the sonata I played was a Theme. Well, was the playing *of* the sonata? Don't worry about whether the question *Was the playing of the sonata?* is nearly ungrammatical. Maybe it isn't proper English, but it is a sentence that speakers understand, and all we need for the test is understanding. (emphasis in original)

The two salient aspects of this representation are that 1) all arguments are realized independently as arguments of thematic relations like Agent and Theme and 2) there is no distinction made within the representation between arguments and adjuncts (although Parsons (1995: 650–651) introduces a distinction in modes of composition for arguments and adjuncts).

The first of these points has the direct consequence that any argument of a verb must have some kind of thematic relation or other predicate that relates it to the event in the logical form. This means, for example, that the propositional or predicative argument of a raising verb like *seem* must be an argument of some relation in the logical form. Based on the treatment of stative verbs noted above, the logical forms for the sentences in (89) would be the corresponding examples in (90):

(89) a. It seems that John is upset.

b. John seems to be upset.

c. John seems upset.

d. John seems like he's upset.

(90) a. (∃s)[Seeming(s) & In(**?**,s) & *R*(s,that John is upset)]

b. (∃s)[Seeming(s) & In(**John?**,s) & *R*(s,that John is upset)]

c. (∃s)[Seeming(s) & In(**John?**,s) & *R*(s,that John is upset)]

d. (∃s)[Seeming(s) & In(**John?**,s) & *R*(s,that John is like he is upset)]

Several problems are immediately apparent. First, in (90a), it is not at all clear what the first argument of the 'In-ness' relation should be. In the other examples, it could arguably be John, but then John is not 'in' a state of seeming in the same sense as someone is in the state of being sick or believing something. It is not even clear what 'a state of seeming' is.

Second, although the complement of the raising verb *seem* (as opposed to its subject) is uncontroversially both a syntactic and semantic argument of the verb and should therefore be realized in the Parsonian logical form as the argument to some thematic relation, it is unclear what the relation *R* would be. If it were to be Theme, according to Parsons's own criteria, it should be possible to say, for example, that 'the seeming is of that John is upset', which is word salad. Granting some extra license to our paraphrase, it is possible to say something like 'the seeming is of John being upset', which is somewhat, though not completely, better. However, now we run into a new problem: 'seeming' or 'the state of seeming' makes very little sense in the absence of the complement to the verb. This is shown by the following contrast:

(91) */#John is in a state of seeming/appearing.

(92) John is in a state of seeming/appearing upset.

These comments equally apply to perceptual resemblance verbs. For example, the contrast in (91) and (92) holds equally for these verbs:

(93) */#John is in a state of looking/sounding.

(94) John is in a state of looking/sounding upset.

All of these points lead to a single conclusion: there is a much tighter relationship between raising verbs and perceptual resemblance verbs and their propositional or predicative complements than predicted or easily accommodated by Parsons's independent conjunct analysis.[16]

[16] Jacobson (1990) reaches a similar conclusion about raising verbs and their infinitival complements, based on contrasts with control verbs on a number of syntactic tests.

In conclusion, PSOURCEs and PGOALs could be thought of as thematic relations in Parson's sense. However, they are not easily accomodated by the specific theory that Parsons proposes, particularly given its general difficulties with the semantics of raising. We will therefore use the term *semantic role* instead of Parson's *thematic relation*.

5.3 Semantic roles, thematic roles and arguments: A synthesis

We have argued that PSOURCE and PGOAL are not thematic roles in the sense of the Theta Criterion, but are rather a generalized kind of thematic relation that we have called a *semantic role*. We have also argued that a copy raising subject is not an argument of the copy raising verb, but that the subject of a perceptual resemblance verb can be an argument of the verb. Lastly, we have indicated that the semantics of copy raising verbs and perceptual resemblance verbs is not readily accommodated in the theory of Parsons (1995) as things stand. In this section, we propose a semantic representation that incorporates aspects of the event semantics of Chierchia (1984), Dowty (1989), Kratzer (1996, 2003), and Parsons (1990, 1995).

We depart from typical Neo-Davidsonian treatments, such as Parsons (1990, 1995) in not treating verbs as one-place predicates on eventualities. Instead, we treat a verb as a relation with an eventuality argument and places for its arguments, as in Davidson (1967) and Dowty (1989). We treat thematic roles as further restrictions on the nature of these arguments. In other words, thematic roles specify what role in the eventuality the argument plays, but are not themselves the specification of the argument. We remain agnostic about whether this mixed sort of representation is appropriate for all verbs or only for certain subclasses, including the raising and perceptual resemblance verbs of interest here. However, we make the simplifying general assumption that the same semantics holds for all verbs, since it does not affect our analysis, although we acknowledge that things are probably substantially more complex than this (see, e.g., Kratzer 1996, 2003). We also follow Chierchia (1984) in treating thematic relations as functions, rather than as relations. We thus adopt a mix of the independent conjunct analysis and the classic Davidsonian representation (what Parsons 1990: 94 calls the "incorporation analysis").

This allows us to maintain a distinction between arguments, thematic roles, and semantic roles, such as PSOURCE and PGOAL, as follows:

(95) **Semantic argument**
A is a semantic argument of a predicate with denotation f iff the denotation of A is in the domain of f.

(96) **Thematic role**
A thematic role specifies the role in the eventuality played by some semantic argument.

(97) **Semantic role**
A semantic role specifies a role in the eventuality played by an entity or eventuality, where the entity/eventuality is not necessarily a semantic argument.

Thematic roles are therefore necessarily borne by semantic arguments, although not all semantic arguments bear a thematic role. Semantic roles are a generalized notion of thematic role: all thematic roles are semantic roles, but not vice versa.

For example, consider the semantics in (99) for the sentence in (98):

(98) Kim kissed Robin in Helsinki yesterday.

(99) $\exists e.kiss(e, kim, robin) \ \wedge \textsc{Agent}(e) = kim \wedge \textsc{Theme}(e) = robin \wedge \textsc{Place}(e) = helsinki \wedge$
$\textsc{Time}(e) = yesterday$

We assume standard existential closure of the event variable. The terms e, kim and $robin$ are all semantic arguments of $kiss$. The thematic roles AGENT and THEME specify the roles in e played by kim and $robin$. Lastly, PLACE and TIME are semantic roles that reflect the semantic contributions of the adjuncts *in Helsinki* and *yesterday* in (98).

Our formalism allows something to be a semantic argument without necessarily bearing a thematic role, although thematic roles are necessarily assigned to arguments. We therefore maintain a version of the second clause of the Theta Criterion, which states that theta roles are assigned to arguments (see section 5.1). However, we explicitly mean thematic roles to restrict semantic arguments, whereas the Theta Criterion applies to syntactic arguments. Thematic roles and semantic arguments are thus deeply connected. However, something can be an argument without bearing a thematic role or other thematic relation. Thus, we do not have to make up a junk predicate to host the propositional complement of a raising verb, which is represented as in:

(100) $seem(\ldots, p)$

The propositional argument p in (100) is a semantic argument, since it occurs as an argument to the function *seem*, but it does not bear a thematic role or semantic role. Semantic roles act similarly to thematic roles in restricting some participant of an eventuality, however these may may or may not be semantic arguments. The distinction between thematic roles and semantic roles in our theory is that the former are *necessarily* borne by arguments, whereas the latter are not.

We have already seen, in relation to example (98), two paradigmatic instances of what we consider to be semantic roles: the time and place of an event. Eventualities are grounded in space/time, but languages in general do not treat these coordinates as arguments — they are typically left implicit. PSOURCE and PGOAL are similarly semantic roles. We do not make a distinction here between time, place and manner adjuncts on the one hand, and PSOURCE and PGOAL on the other. However, there is perhaps good motivation for such a distinction. Time, place and manner adjuncts can be freely added to any eventuality, whereas PSOURCE and PGOAL are restricted to eventualities with a perceptual dimension. Furthermore, there are specific lexical restrictions on PSOURCE and PGOAL. The verb *verka* in Swedish does not allow the overt expression of a PGOAL in many dialects (see (41) above). Also, the PSOURCE of the verb *tyckas* cannot be expressed as a copy raising subject, only as a *på*-PP:

(101) a. Det tycks på Tom som om han har givit upp.
it seems on T. as if he has given up
'Tom seems as if he has given up.'

b. * Tom tycks som om han har givit upp.
T. seems as if he has given up.

PSOURCEs and PGOALs thus differ from time, place and manner adjuncts in that their distribution and form are lexically restricted. This distinction is not directly relevant here, and so we will not try to invent any new terminology to reflect the two types of semantic role. We simply note here that the PSOURCE and PGOAL roles can be classified together with the role INSTRUMENT, exemplified by the English instrumental *with*-phrase, such as *with a knife*. An instrumental *with*-phrase is a syntactic adjunct, which does not correspond to a semantic argument, but which bears the semantic role INSTRUMENT. In this respect it is similar to time, place and manner expressions, but like PSOURCE and PGOAL, INSTRUMENT is restricted in that it cannot appear freely with just any eventuality.

Abstracting away from certain complications that we explore in subsequent sections, we derive the meaning in (102b) for the copy raising example in (102a) and the meaning in (103b) for the related perceptual resemblance example in (103a) (the function $aural$ in (103b) is discussed in section 6.5):

(102) a. John seems to me like he's upset.

b. $\exists s.seem(s, upset(john)) \wedge \text{PSOURCE} = john \wedge \text{PGOAL} = speaker$

(103) a. John sounds to me like he's upset.

b. $\exists s.sound(s, aural(john), upset(john)) \wedge \text{PSOURCE} = john \wedge \text{PGOAL} = speaker$

We thus have exactly the divisions that we have argued for. The complements of the raising verb and the perceptual resemblance verb are treated as arguments of the verbs, but they are not restricted by a thematic relation. The semantic role PSOURCE is filled by the subject's meaning, $john$, or an aspect of the subject's meaning, $aural(john)$. However, the subject is not a semantic argument of the copy raising verb, since its denotation does not occupy a slot in the verbal relation. Indeed, the subject is not directly a semantic argument of the perceptual resemblance verb either, although its denotation does serve as an argument to an argument of the PRV. This points to a subtler understanding of the semantics of raising and control, which we develop in section 6. Note that in both cases, though, *John* is occupying a syntactic argument position: subject. *John* is therefore a syntactic argument to both the copy raising verb and the perceptual resemblance verb, but is not a semantic argument to either. The other semantic role, PGOAL, picks out the speaker, where this information is contributed by the modifier *to me*, which is a syntactic adjunct and not a semantic argument.

5.4 Summary

We have argued in previous sections that the notion of perceptual source is crucial for solving the puzzle of the absent cook and the *på* puzzle. The present section has concerned the status of the PSOURCE role and also the status of the PGOAL role. The copy raising PSOURCE in not an argument in the sense of the Theta Criterion. It is more similar to a Parsonian thematic relation, but the specifics of Parsons's theory do not readily capture perceptual sources and goals within the context of a semantics for copy raising and perceptual resemblance verbs. We therefore treat PSOURCE and PGOAL as more generalized roles, which we call semantic roles.

All of this points to a potentially interesting conclusion. The copy raising verbs *seem/appear/verka* and the perceptual resemblance verbs all crucially involve perception. Perception in turn must involve a perceiver (PGOAL) and something that is perceived (PSOURCE). However, these perceptual participants are not necessarily encoded as thematic arguments, despite their central role in the semantics of perception. In the case of copy raising verbs, neither the perceiver nor the source of perception is an argument. In the case of perceptual resemblance verbs, the source of perception can be an (indirect) argument, but the perceiver is still realized as an adjunct. It might, at first blush, be surprising that such core aspects of eventualities are not more tightly integrated into the semantics of the predicates that denote the eventualities. However, it is perhaps much less surprising when we think of temporal and locational aspects of eventualities. The semantics of the vast majority of predicates is such that they involve a time and place, but this information is typically purely implicit and is only realized explicitly in modifiers. The perceiver and the source of perception are similarly integral to these kinds of events and are similarly not necessarily tied to arguments and instead realizable as modifiers. Thus, PSOURCEs and PGOALs are entailed participants in perceptual states and there are parallels between perceptual sources/goals and temporal and locative modifiers of eventualities: eventualities in general entail a time and location, yet these entailments are only sometimes overtly realized. However, it was pointed out above that there are also differences between time and place adjuncts on the one hand and PSOURCE and PGOAL on the other. Specific verbs and classes of verbs can specify *whether* and *how* they express their perceptual sources and goals. This is captured in our analysis by reference to PSOURCE and PGOAL in the lexical entries of the verbs. Although we will not attempt to formalize it further, we assume that modifying expressions of time, place and manner are added by some more general mechanism and not included in the lexical entry of every verb.

6 Formal analysis

We hope that we have been sufficiently clear in our informal presentation that the empirical generalizations and the solutions to the two puzzles are already apparent. We will now present a formal analysis that will capture the key points, but which leaves certain details aside. Our analysis builds on the work of Asudeh (2002, 2004) and some further details can be found therein, although the present analysis makes considerable innovations. A particular detail that we leave aside, and that Asudeh discusses in some depth, is the syntactic and semantic contributions of the prepositions *like* and *as*, and by extension Swedish *som*, in copy raising and expletive examples, although we will present aspects of their syntax that cannot be avoided. Our analysis is formalized in Lexical Functional Grammar (LFG; Kaplan and Bresnan 1982, Bresnan 2001, Dalrymple 2001) with Glue Semantics (Glue; Dalrymple 1999, 2001).

The section is organized as follows. First, we present LFG lexical entries for English *seem/appear* and Swedish *verka* that anticipate and bring together the syntactic and semantic details. Second, we present the syntax of raising and copy raising, with particular reference to functional structures in LFG. Third, we sketch Asudeh's (2002, 2004) treatment of copy raising as resumption and the theory of the syntax–semantics interface in which his analysis is couched. Fourth, we turn to an event semantics analysis of the facts discussed in sections 2–5. We first discuss the semantics of copy raising verbs, setting PSOURCEs and PGOALs aside. We show that the semantics of copy raising reveals a fine-grained semantic space for control and raising. We then investigate the semantics of PSOURCE and PGOAL in some detail and show how our analysis solves the *på* puzzle and the puzzle of the absent cook. Lastly, we present an analysis of the semantics of perceptual resemblance verbs and consider further implications for the semantics of control and raising.

6.1 Lexicon

In this section we present LFG lexical entries for English *seem/appear* and Swedish *verka* and *på* (in its PSOURCE usage). We use Glue Semantics (Dalrymple 1999, 2001) to represent the meanings and how they compose. Glue Semantics is discussed further in section 6.3. Since LFG is a strongly lexicalist theory, the lexical entries that are presented here essentially constitute our analysis of the syntax and semantics of raising and copy raising in English and Swedish. However, we leave the details of the syntax and semantics for subsequent sections. Here we will just indicate what the general effects of each part of the entries are.

6.1.1 English

We deal first with English *seem/appear*. The subcategorizations for *seem/appear* that we have identified in previous sections, with relevant examples, are as follows:

(104) Subject-to-subject raising, infinitival complement (XCOMP)

a. Kim seems/appears to have won.

b. It seems/appears to have rained.

c. There seems/appears to be a problem.

d. The cat seems/appears to be out of the bag.

(105) Subject-to-subject raising, predicative complement (XCOMP)

a. Kim seems/appears upset.

b. Kim seems/appears under the weather.

c. It seems/? appears rainy.

(106) *That*-complement (COMP)

a. It seems/appears (that) Kim has won.

b. It seems/appears (that) Kim is upset.

c. It seems/appears (that) it rained.

d. It seems/appears (that) the cat is out of the bag.

(107) Expletive-subject copy raising (XCOMP)

a. It seem/appears like/as if/as though Kim has won.

b. It seems/appears like/as if/as though there is a problem.

c. There seems/appears like/as if/as though there is a problem.

d. The cat seems/appears like/as if/as though it is out of the bag.

(108) Non-expletive-subject copy raising (XCOMP)

a. Fido seems/appears like/as if/as though he has been pricked by that porcupine again.

b. Fido seems/appears like/as if/as though that porcupine's pricked him again.

The lexical entry in (109) captures all of these subcategorizations:

(109) *seem/appear* V (↑ PRED) = 'seem/appear⟨CF⟩SUBJ'

Case 1: Examples (104–107)

$$\left\{\begin{array}{l} (\uparrow \text{SUBJ}) = (\uparrow \text{XCOMP SUBJ}) \\ \{\ (\uparrow \text{XCOMP PTYPE}) \neq \text{CLAUSAL-COMPAR} \quad \vee \quad \neg(\uparrow \text{SUBJ PRED})\ \} \\ \qquad\qquad \bigvee \\ \neg(\uparrow \text{SUBJ PRED}) \\ (\uparrow \text{SUBJ FORM}){=}\text{IT} \\ (\uparrow \text{COMP MOOD}){=}\text{DECLARATIVE} \end{array}\right\}$$

$\lambda p \lambda s.seem/appear(s, p) : (\uparrow \text{CF})_\sigma \multimap (\uparrow_\sigma \text{EVAR}) \multimap \uparrow_\sigma$

$\lambda S \lambda s.\exists v_\varepsilon[S(s) \wedge \text{PSOURCE}(s) =_t v_\varepsilon] : [(\uparrow_\sigma \text{EVAR}) \multimap \uparrow_\sigma] \multimap [(\uparrow_\sigma \text{EVAR}) \multimap \uparrow_\sigma]$

$\bigvee$

Case 2: Examples (108a–b)

$(\uparrow \text{SUBJ}) = (\uparrow \text{XCOMP SUBJ})$

$(\uparrow \text{XCOMP PTYPE}) =_c \text{CLAUSAL-COMPAR}$

$(\uparrow \text{SUBJ})_\sigma = ((\uparrow \text{XCOMP GF}^+)_\sigma \text{ ANTECEDENT})$

$\lambda x \lambda P \lambda s.seem/appear(s, P(x)) \wedge \text{PSOURCE}(s) =_t x :$
$(\uparrow \text{SUBJ})_\sigma \multimap [(\uparrow \text{SUBJ})_\sigma \multimap (\uparrow \text{XCOMP})_\sigma] \multimap (\uparrow_\sigma \text{EVAR}) \multimap \uparrow_\sigma$

Manager Resource:

$\lambda f \lambda x.x : [(\uparrow \text{SUBJ})_\sigma \multimap ((\uparrow \text{SUBJ})_\sigma \otimes (\uparrow \text{XCOMP GF}^+)_\sigma)] \multimap [(\uparrow \text{SUBJ})_\sigma \multimap (\uparrow \text{SUBJ})_\sigma]$

Note that the lines in bold are not part of the lexical entry as such, but will be used for the exposition below. Note also that disjunction has been notated as $\vee$ or as $\{\ldots \vee \ldots\}$ where there is potential ambiguity in grouping.

Observe that the lexical entry (109) has a common PRED value for all of the subcategorizations of *seem/appear*. The SUBJ argument is a non-thematic argument (occurring outside the angled brackets). Thus, in all of its subcategorizations, *seem/appear* takes a subject as a non-thematic, syntactic argument. The sole thematic argument (occurring within the angled brackets) is the grammatical function CF, which stands for COMPLEMENT FUNCTION. The function CF is defined as follows:

(110) $\text{CF} \equiv \text{COMP} \vee \text{XCOMP}$

In other words, CF is a generalization over the possible complement functions — the closed function COMP and the open function XCOMP (Bresnan 1982, Kaplan and Bresnan 1982) — and any instance of CF must therefore be realized as either COMP or XCOMP.

The remainder of the lexical entry is a disjunction. The two cases of the disjunction and the relevant sorts of examples for each case are indicated by the lines marked 'Case' in bold in (109). The two cases are motivated by the difference in semantics between true copy raising — i.e., *seem/appear* with a non-expletive subject and a *like/as*-complement, as in (108) — and the other uses of *seem/appear*, as in (104–107). We have argued that there is a subtle but crucial difference between the semantics of true, non-expletive copy raising and the semantics of the other subcategorizations of *seem/appear*. Namely, the non-expletive copy raising subject is lexically specified as the PSOURCE of the true copy raising verb, whereas this is not so for the other subcategorizations.

The first part of the lexical entry, identified as Case 1 in (109), is appropriate for the subcategorizations exemplified in (104–107) — that is, for all of the cases other than true copy raising. Turning first to the semantics, but leaving most of the details aside for now, we observe two key aspects: 1) the raising verb does not lexically specify its subject to be its PSOURCE and 2) the PSOURCE is existentially closed (see section 4 above and section 6.4.3.2 below). The core semantics of the raising verb and the existential closure are represented as separate Glue meaning constructors. This is not a necessary feature of the analysis: a single meaning constructor combining the verb part and the existential closure part would be equally possible, since the two meaning constructors simply compose through functional application (see section 6.4). However, it is helpful for subsequent expository purposes to separate out the information.

The semantic part of Case 1 is common to all subcategorizations exemplified in (104–107), but the distinct subcategorizations need to be picked out by differing syntactic specifications. There are two sub-cases within Case 1. The first sub-case is appropriate for subject-to-subject raising with an infinitival or predicative complement, as in (104) and (105), and for expletive-subject copy raising, as in (107). These cases all have an open, XCOMP complement whose SUBJ simultaneously serves as the SUBJ of *seem/appear* through the standard LFG raising equation ($\uparrow$ SUBJ) = ($\uparrow$ XCOMP SUBJ). Satisfaction of this equation also ensures that the CF in the verb's PRED is realized as XCOMP. The next part of the first sub-case in Case 1 has to do with correctly separating expletive-subject copy raising from non-expletive-subject (true) copy raising. We use the standard feature PTYPE (for PREPOSITION-TYPE; Butt et al. 1999, Dalrymple 2001) with the value CLAUSAL-COMPAR(ATIVE) to pick out *like/as*-complements (Asudeh 2004). The specification indicates that either the verb's complement's PTYPE is not CLAUSAL-COMPAR or else the verb's SUBJ has no PRED — i.e., it is an expletive or an idiom chunk. The specification has the effect of picking out any subcategorization of *seem/appear* except one in which the XCOMP PTYPE is CLAUSAL-COMPARATIVE (i.e., a *like/as*-complement) and which has a contentful SUBJ (i.e, not an expletive or idiom chunk). In other words, the first sub-case of Case 1 picks out any subcategorization of *seem/appear* with an open XCOMP complement *except* true copy raising.

The second sub-case of Case 1 picks out subcategorizations of *seem/appear* with an expletive *it* subject and a declarative complement, as in (105). The specification $\neg$($\uparrow$ SUBJ PRED) ensures that the verb's subject is non-contentful and the equation ($\uparrow$ SUBJ FORM) = IT further restricts the non-contentful subject to the pronoun *it*. Together these specifications have the effect of subcategorizing for an expletive *it* subject. The last specification, ($\uparrow$ COMP MOOD) = DECLARATIVE, ensures that 1) CF is realized as a closed COMP complement and 2) the com-

plement is declarative. It is an independent syntactic property of English declarative complements that they can be optionally introduced by the complementizer *that*. Appendix A.2 contains the f-structure and Glue proof for the syntax and semantics of an example of Case 1.

The second case in the lexical entry (109) is for true, non-expletive-subject copy raising, as in (108). Turning first to the semantic part, we observe that the Glue meaning constructor lexically specifies that the variable corresponding to the raising verb's SUBJ resource — the variable x in the meaning language side to the left of the colon — is also equated with its PSOURCE. We return to the details of this in section 6.4. The important point is that the true copy raising subcategorization of the verb *seem/appear* lexically specifies its subject to be its PSOURCE, which we observed was not the case for the subcategorizations captured by Case 1. The last specification in the semantics for Case 2 is the manager resource, which has to do with how the copy pronoun is licensed. It licenses the pronoun together with the binding equation $(\uparrow \text{SUBJ})_\sigma = ((\uparrow \text{XCOMP GF}^+)_\sigma \text{ ANTECEDENT})$ (Dalrymple 1993, Asudeh 2005b). This binding equation is in itself potentially sufficient to require a pronominal element in the complement to the copy raising verb, but it does not solve the problem of semantic composition presented by the pronoun, which is the role of the manager resource. We discuss manager resources more fully in section 6.4. Finally, the syntactic environment for non-expletive-subject copy raising is specified through the two equations $(\uparrow \text{SUBJ}) = (\uparrow \text{XCOMP SUBJ})$ and $(\uparrow \text{XCOMP PTYPE}) =_c$ CLAUSAL-COMPAR. The first equation indicates that the copy-raised subject is shared as the subject of an open XCOMP complement. Note that this structure-sharing is *not* what captures the relationship between the copy-raised subject and the copy pronoun, which is rather captured through anaphoric binding; we return to this in section 6.2. The *like/as*-complement is thus treated as a predicative complement. The second equation uses standard LFG constraining equality to ensure that that the XCOMP complement's PREPOSITION-TYPE is CLAUSAL-COMPAR — i.e., that the complement is a *like/as*-complement. Note that these equations also have the effect of instantiating CF to XCOMP. Appendix A.1 contains the f-structure and proof for the syntax and semantics of an example of true, non-expletive-subject copy raising in English.

6.1.2 Swedish

We next turn to Swedish *verka* ('seem'). The subcategorizations for *verka* that we have identified in previous sections, with relevant examples, are as follows:

(111) Subject-to-subject raising, infinitival complement (XCOMP)

a. Kim verkar vara glad.
K. seems be.INF happy
'Kim seems to be happy.'

b. Kim verkar ha vunnit.
K. seems have.INF won
'Kim seems to have won.'

c. Det verkade regna.
It seemed rain.INF
'It seemed to rain.'

(112) Subject-to-subject raising, predicative complement (XCOMP)

a. Kim verkar tokig.
K. seems crazy

b. Kim verkar i toppform.
K. seems in top.shape
'Kim seems in great shape.'

(113) Expletive-subject copy raising (XCOMP)[17]

a. Det verkar som om Kim är här.
It seems as if K. is here

b. Det verkar på Tom som om Kim är här.
It seems on T. as if K. is here
$\sim$'Tom gives the impression that Kim is here.'

c. Tärningen verkar som om den är kastad.
die.DEF seems as if it is cast
'The die seems as if it is cast.'

(114) Non-expletive-subject copy raising (XCOMP)
Tom verkar som om han har vunnit.
T. seems as if he has won
'Tom seems as if he has won.'

We have not included *på*-PPs in these examples. We present a lexical entry in (116) for *på* in the relevant usage.

The following lexical entry for *verka* captures all of the subcategorizations in (111–114):

(115) *verka* V $(\uparrow \text{PRED}) = \text{`seem}\langle \text{XCOMP} \rangle \text{SUBJ'}$
$(\uparrow \text{SUBJ}) = (\uparrow \text{XCOMP SUBJ})$

Case 1: Examples (111–113)

$$\lambda p \lambda s.seem(s,p) : (\uparrow \text{XCOMP})_\sigma \multimap (\uparrow_\sigma \text{EVAR}) \multimap \uparrow_\sigma$$

$$\left\{ \begin{array}{l} (\uparrow \text{SUBJ PRED}) \\ \lambda S \lambda s. \exists v_\varepsilon [S(s) \wedge \text{PSOURCE}(s) =_t v_\varepsilon] : \\ [(\uparrow_\sigma \text{EVAR}) \multimap \uparrow_\sigma] \multimap [(\uparrow_\sigma \text{EVAR}) \multimap \uparrow_\sigma] \\ \qquad \bigvee \\ \neg(\uparrow \text{SUBJ PRED}) \\ \left(\begin{array}{l} \lambda S \lambda s. \exists v_\varepsilon [S(s) \wedge \text{PSOURCE}(s) =_t v_\varepsilon] : \\ [(\uparrow_\sigma \text{EVAR}) \multimap \uparrow_\sigma] \multimap [(\uparrow_\sigma \text{EVAR}) \multimap \uparrow_\sigma] \end{array} \right) \end{array} \right\}$$

$$\bigvee$$

Case 2: Example (114)

$(\uparrow \text{XCOMP PTYPE}) =_c \text{CLAUSAL-COMPAR}$
$(\uparrow \text{SUBJ})_\sigma = ((\uparrow \text{XCOMP GF}^+)_\sigma \text{ ANTECEDENT})$

$$\lambda x \lambda P \lambda s.seem(s, P(x)) \wedge \text{PSOURCE}(s) =_t x :$$
$$(\uparrow \text{SUBJ})_\sigma \multimap [(\uparrow \text{SUBJ})_\sigma \multimap (\uparrow \text{XCOMP})_\sigma] \multimap (\uparrow_\sigma \text{EVAR}) \multimap \uparrow_\sigma$$

Manager Resource:

$$\lambda f \lambda x.x : [(\uparrow \text{SUBJ})_\sigma \multimap ((\uparrow \text{SUBJ})_\sigma \otimes (\uparrow \text{XCOMP GF}^+)_\sigma)] \multimap [(\uparrow \text{SUBJ})_\sigma \multimap (\uparrow \text{SUBJ})_\sigma]$$

[17] A native-speaker survey shows that not all Swedish speakers find example (113b) acceptable with the idiomatic reading.

This entry is largely the same as (109). We analyze *verka* as involving raising from XCOMP in all cases; in other words, there is no equivalent of a *that*-complement for Swedish *verka* (see the discussion in section 2 above and in section 6.2 below). The lexical entry for *verka* therefore subcategorizes for XCOMP, rather than CF. This also means that the equation (↑ SUBJ) = (↑ XCOMP SUBJ) is common to all subcategorizations of *verka*.

The lexical entry is once again split into two main cases, according to the semantic distinction between true copy raising and the other subcategorizations. Case 2 in (115) captures true, non-expletive-subject copy raising. Note that Case 2 in the lexical entry for Swedish *verka* is identical to Case 2 in the lexical entry for English *seem/appear*, which we have already discussed above, except that the raising equation has been factored out.

Case 1 in (115) deals with subject-to-subject raising, as in (111) and (112), and with expletive-subject copy raising, as in (113). None of these cases involve lexical specification of the subject as PSOURCE, which can be confirmed by inspection of the Glue meaning constructor. We argue in section 6.4.3.2 below that Swedish subject-to-subject raising involves obligatory existential closure of PSOURCE, whereas expletive-subject copy raising involves only optional existential closure of PSOURCE. Case 1 is therefore split into two sub-cases. The first sub-case must have a contentful subject, due to the specification (↑ SUBJ PRED), and is therefore applicable only to instances with a subject that is not an expletive or idiom chunk. The specification (↑ XCOMP PTYPE) $\neq$ CLAUSAL-COMPAR further excludes *som*-complements; i.e., this part of the lexical entry does not apply to non-expletive-subject copy raising (which is dealt with in the part of the entry that is indicated by Case 2). The second sub-case of Case 1 must not have a contentful subject , due to the specification $\neg$(↑ SUBJ PRED), and is therefore applicable only to instances with a subject that is not an expletive or idiom chunk. The two sub-cases share a common core semantics for raising, indicated in the first line of Case 1, but the first sub-case has an obligatory existential closure associated with it, whereas the second sub-case has an optional existential closure. The optionality is represented using the standard LFG notation of parentheses.

Lastly, we present the lexical entry for *på* in the usage that contributes a PSOURCE:

(116) *på*

$(\uparrow \text{PRED}) = \text{`on}\langle\text{OBJ}\rangle'$

$\lambda x \lambda S \lambda s.S(s) \wedge \text{PSOURCE}(s) =_t x :$
$(\uparrow \text{OBJ})_\sigma \multimap$
$[[((\text{ADJ} \in \uparrow)_\sigma \text{EVAR}) \multimap (\text{ADJ} \in \uparrow)_\sigma] \multimap$
$[((\text{ADJ} \in \uparrow)_\sigma \text{EVAR}) \multimap (\text{ADJ} \in \uparrow)_\sigma]]$

The preposition lexically specifies that its object is the PSOURCE of the verb that the resulting PP modifies. The result of composition is that the PP's object is the verb's PSOURCE. Appendix A.3 contains the f-structure and proof for the syntax and semantics of a Swedish *på*-PP example.

6.2 Syntax

We do not show c(onstituent)-structure trees for raising and copy raising, because these are rather straightforward (see Asudeh 2004). English finite *that*-complements are analyzed as closed CP complements, with the subject of the raising verb realized as an expletive *it*. Asudeh (2002, 2004) argues that the complement phrases in copy raising are predicative PPs, headed by *like* or *as*. We make standard assumptions about the syntax of raising in f(unctional)-structures (Bresnan 1982). In particular, we assume that raising involves functional control of an open complement's subject by the raised subject. Following Asudeh, we similarly treat copy raising verbs as functionally controlling the *like*/*as*-complement's subject. Thus, quite apart from the relationship between the copy raising subject and the copy pronoun, copy raising verbs involve raising of the subject of the predicative *like*/*as*-complement. Perceptual resemblance verbs similarly raise the subject of their *like*/*as*-complement. The distinction between copy raising verbs

and perceptual resemblance verbs rests on the fact that the latter do not require a copy pronoun. This is captured through a lexical difference in semantic composition that is explored in section 6.3.

The following sentences are assigned the f-structures indicated (leaving various irrelevant details aside), where more than one sentence type may correspond to a single f-structure type:

(117) Subject-to-subject raising

a. Infinitival complement

i. Kim seems to have left.

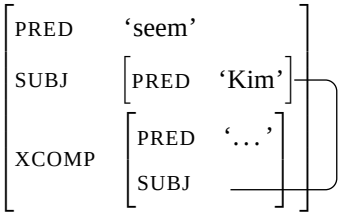
ii. Kim verkar ha åkt.
K. seems have.INF left
'Kim seems to have left.'

b. Predicative complement

i. Kim seems crazy.

ii. Kim verkar tokig.
K. seems crazy

c. F-structure (underspecified) for subject-to-subject raising:



(118) Copy raising and perceptual resemblance

a. True (non-expletive-subject) copy raising

i. Tom seems like he is cooking.

ii. Tom verkar som om han lagar mat.
T. seems as if he makes food
'Tom seems as if he's cooking.'

b. Perceptual resemblance

i. Tom looks like Fred is late again.

ii. Tina smells as if Fred must have brought his smelly dog around.

iii. Tom ser ut som om Fred är sen igen.
T. looks out as if F. is late again.
'Tom looks as if Fred is late again.'

iv. Tina luktar som om Fred har varit här med sin illaluktande hund nu igen.
T. smells as if F. has been here with his bad.smelling dog now again.
'Tina smells as if Fred has been here with his smelly dog again.'

c. Expletive variants of copy raising and perceptual resemblance

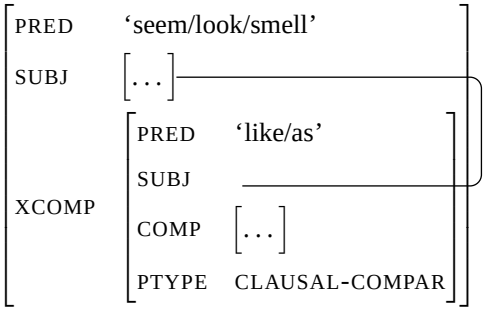
i. It seems like Tom is cooking.

ii. Det verkar som om Tom lagar mat.
It seems as if T. makes food
'It seems as if Tom is cooking.'

iii. It smells like Tom is cooking.

iv. Det luktar som om Tom lagar mat.
It smells as if T. makes food
'It smells as if Tom is cooking.'

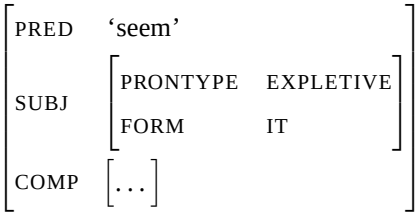
d. F-structure (underspecified) for copy raising and perceptual resemblance, including both non-expletive-subject and expletive-subject variants:



(119) *That*-complement

a. It seems that Tom has left.

b. F-structure (underspecified):



The f-structure in (117) shows the standard LFG treatment of subject-to-subject raising as equality between the raised SUBJ and the SUBJ of an open complement XCOMP (Bresnan 1982). We assume that this is the syntax for raising from an infinitival or predicative complement in both English and Swedish.

In (118), we show the f-structure for copy raising and perceptual resemblance, including expletive variants, in both English and Swedish. Notice that, as far as the outermost f-structure corresponding to the matrix clause is concerned, f-structure (118) is identical to (117); that is, there is a functional equality between the SUBJ of the raising verb and the SUBJ of its *like/as*-complement COMP (complement). This has two immediate consequences. First, the syntax of copy raising and perceptual resemblance is, on this analysis, just the syntax of raising from a predicative complement. In both cases there is a functional control equality between the matrix subject and the complement's subject. Second, copy raising and perceptual resemblance are treated as syntactically identical, which accounts for their identical subcategorization capablities, as explored in section 2. The two key differences between these two verb types are 1) whether a copy pronoun is necessary in the complement and 2) subtle differences in the semantics of the perceptual source. These are captured as lexical differences in the semantics of copy raising and perceptual resemblance; the lexical distinctions are discussed in sections 6.3 and 6.5.

The XCOMP complement in (118) contains the further information that its PREPOSITION-TYPE is CLAUSAL-COMPARATIVE; we assume that this PTYPE is contributed by the prepositions *like*, *as*, and *som* when they take full clausal complements. Two further comments are in order about (118). First, it is important to realize

that we treat the expletive and non-expletive variants as equally involving raising of the subject of the *like*/*as*/*som*-complement. In particular, expletive subjects of copy raising and perceptual resemblance verbs are raised from the complement and not generated in matrix subject position (see Horn 1981: 353–356 for evidence of expletive raising in copy raising). Second, as is already evident, we group Swedish *som* with *like* and *as* and treat Swedish expletive examples as having the same syntax as English ones. However, since the *som om* complement is for most speakers of Swedish the only way for a raising verb to combine with an expletive subject and a finite clause, it might be that the syntax of Swedish expletive examples is more like that of (119), the *that*-complement case. This would be somewhat surprising, though, given the general similarity of meaning and complementation possibilities between English *like*/*as* and Swedish *som*. Furthermore, some Swedish speakers do produce complements to *verka* ('seem') that are headed by the complementizer *att* ('that'), which is the complementizer used with factives, propositional attitudes, beliefs, etc. It is a reasonable assumption that these *att*-complements have the syntax in (119) and that *som*-complements have the syntax in (118). Having said that, it does not really matter for our semantic analysis, just for the organization of our lexical entry for *verka* in section 6.1.2; the lexical entry would have to be reorganized appropriately if the facts turn out to be different.

The *på*-PP and *to*-PP adjuncts, in Swedish and English respectively, contribute to the ADJ(UNCT) grammatical function of the verb they modify:

(120) PP adjuncts

a. It seems to me like Kim has left.

b. Det verkar på Kim som om Tom har åkt.
It seems on K. as if T. has left
$\sim$'Kim gives the impression that Tom has left.'

(121)
$$\begin{bmatrix} \text{PRED} & \text{'seem}\langle \ldots \rangle\text{SUBJ'} \\ \ldots & \\ \text{ADJ} & \left\{ \begin{bmatrix} \text{PRED} & \text{'to/on}\langle \text{OBJ} \rangle\text{'} \\ \text{OBJ} & [\ldots] \end{bmatrix} \right\} \end{bmatrix}$$

Note that the value of ADJ is a set containing all of an item's adjuncts (Kaplan and Bresnan 1982).

Lastly, it is important to avert a potential misunderstanding here. According to this syntactic analysis, there is a standard syntactic raising relationship between the copy raising verb and its *like/as*-complement. This is captured in LFG through a functional equality between the matrix copy raising verb's SUBJ and the SUBJ of the *like/as*-complement XCOMP. It is what allows *like/as*-complements to be subsumed, from a syntactic perspective, by the general class of predicative complements. However, this does not have the consequence that only subjects can be copy pronouns, a position which we argued against explicitly in section 5.1. The copy pronoun is embedded somewhere inside the COMP (complement) of the *like/as*-complement. The copy pronoun is *not* the raised SUBJ of the *like/as*-complement. In Asudeh's analysis, there is no syntactic raising relationship between the copy raising subject and the copy pronoun; rather, it is an anaphoric relationship.

For example, consider (122) and (123):

(122) Tom seems like he hurt Bill again.

(123) Tom seems like Bill hurt him again.

In both (122) and (123), *Tom* is the raised subject that is simultaneously the SUBJ of the matrix verb and the SUBJ of the verb's *like*-complement XCOMP. Obviously, in neither case is *Tom* the copy pronoun. In (122), the copy pronoun is the subject of the complement of the *like*-complement (i.e., the raising verb's XCOMP's COMP's SUBJ), but in (123) the copy pronoun is the object of the complement of the *like*-complement (i.e., the raising verb's XCOMP's COMP's OBJ). As demonstrated in section 5.1, the copy pronoun could be yet more deeply embedded, which is predicted by the anaphoric binding relationship between the copy-raised subject and the copy pronoun.

In the next section, we explore the relationship between the copy raising subject and the copy pronoun and the licensing mechanism for the pronoun and the copy-raised subject.

6.3 The syntax–semantics interface: Copy pronouns and manager resources

Asudeh (2002, 2004) argues that the syntactic relationship between a non-expletive copy-raised subject and the copy pronoun is nothing more than normal anaphoric binding. This immediately has a number of key benefits:

1. No special syntactic mechanism needs to be invoked to establish the structural relation in copy raising, unlike in other accounts (see, e.g., Ura 1998, Fujii 2005, and Potsdam and Runner 2001).

2. The copy pronoun is correctly predicted to potentially be an unbounded distance from the copy raising subject (see section 5.1), due to the normal unbounded nature of anaphoric binding. Importantly, the unbounded nature of the relation is captured without treating it as a long-distance dependency (e.g., *wh*-movement), which would be problematic, since the copy-raised subject is syntactically in an argument position.

3. The antecedent of the copy pronoun must command the pronoun appropriately. For example, a constituent inside the copy raising verb's subject cannot bind the copy pronoun, only the subject itself:

   (124) *Tom's mother seems like he has been punished.

   (125) Tom seems like he has been punished.

4. A quantificational copy raising subject is properly predicted to bind the pronoun as a bound variable (Lappin 1984, Potsdam and Runner 2001, Fujii 2005):

   (126) Most contestants seemed like they were confident.

In sum, one further important syntactic aspect of the analysis of copy raising that we adopt is anaphoric binding. This sets copy raising apart from subject-to-subject raising: although both involve an actual raising relation between the raising verb's subject and the subject of its complement (see the previous section), only copy raising involves a further anaphoric binding relation.

The anaphoric binding relation does a lot of work in explaining properties of copy raising, but it cannot answer one crucial question: How is a non-expletive copy-raised subject licensed, if it is not an argument of the copy-raising verb? This is the central question of copy raising. Asudeh (2002, 2004) proposes that this should be understood as a problem of semantic composition. In particular, he notes that, once understood in this light, copy raising is like a case of resumption, where resumptive pronouns can also be understood essentially as a problem of semantic composition. In both cases, there is a pronoun saturating a semantic argument position that must be left open in order to properly compose the subject (for copy raising) or the top of the resumptive long-distance dependency (for resumptive pronouns in unbounded dependencies). The removal of the pronoun from semantic composition is carried out by a lexically specified *manager resource*. Thus, both types of resumption are licensed through lexical specification. In the case of copy raising, it is the specification of a manager resource that licenses the copy raising subject and the copy raising

relation. Anaphoric binding of the copy pronoun by the subject syntactically identifies the pronoun that is causing the saturation problem for semantic composition and the manager resource effects its removal during composition. The key difference between copy raising verbs and perceptual resemblance verbs is then reduced to a simple lexical difference: copy raising verbs contribute manager resources, perceptual resemblance verbs do not.

The term *manager resource* itself stems from Glue Semantics (Dalrymple 1999, 2001), a theory of the syntax–semantics interface and semantic composition. In Glue Semantics, the logic of semantic composition is linear logic (Girard 1987), which is a resource logic, as discussed in more detail below. Each lexically contributed meaning consists of a term from a meaning language associated with a term of linear logic. These paired terms are called *meaning constructors* and are represented as follows:

(127) $\mathcal{M} : G$

$\mathcal{M}$ is the meaning language term and G is the linear logic term (the colon is an uninterpreted pairing symbol). The linear logic serves as a 'glue language' that relates syntax to semantics and specifies how semantic terms are to be composed. The meaning constructors are used as premises in a (linear logic) proof that consumes the lexical premises to produce a sentential meaning. A successful Glue proof proves a conclusion of the following form (following Crouch and van Genabith 2000: 117), where G_t is a term of type t:[18]

(128) $\Gamma \vdash \mathcal{M} : G_t$

Each step in the linear logic proof of semantics corresponds to an operation in the meaning language via the Curry-Howard isomorphism between formulas and types (Curry and Feys 1958, Howard 1980). This means that the syntactic well-formedness of the proof can be calculated using standard proof-theoretic methods on G while simultaneously constructing meaning terms in the meaning language $\mathcal{M}$. The meaning language $\mathcal{M}$ itself is standardly interpreted model-theoretically, as is the case in this paper. Thus, although semantic composition is driven proof-theoretically, interpretation is model-theoretic. This has the advantage that meaning construction is sensitive only to the linear logic types of the meaning constructors and not to the actual meanings in $\mathcal{M}$. Compositionality is therefore guaranteed, since no assumptions are made about the content of meaning terms in assembling meanings (Dalrymple et al. 1999a: 262–263). The linear logic proof thus serves as the syntax of semantic composition, which reveals a clear relationship between linear logic terms in Glue Semantics and categories in Categorial Grammar (Ajdukiewicz 1935, Bar-Hillel 1953, Lambek 1958, Ades and Steedman 1982, Steedman 1996, 2000, Buszkowski et al. 1988, Oehrle et al. 1988, Morrill 1994, Carpenter 1997, Moortgat 1997), as discussed in detail by Dalrymple et al. (1999a). Another perspective on this relationship is that linear logic is essentially equivalent to the commutative Lambek Calculus (Moortgat 1997, Asudeh 2004, Jäger 2005). In his discussion of desirable properties of "Lambek-style Categorial Grammar", Jäger (2005: ix) notes that "[T]he Curry-Howard correspondence ... supplies the type logical syntax with an extremely elegant and independently motivated interface to model-theoretic semantics." This comment equally applies to Glue Semantics.

Let us consider a simple Glue derivation. Syntactic analysis of the sentence in (129) yields the meaning constructors in (130). Note that we assign the linear logic terms in the meaning constructors mnemonic names, thus suppressing some details of the instantiation of meaning constructors at the syntax–semantics interface; see Asudeh (2004, 2005b). The connective in (130) is linear implication ($\multimap$).

(129) John laughed.

(130) 1. $john : j_e$

[18] The typing in the linear logic side G is independent of, but related to, the typing in the meaning language $\mathcal{M}$. The relationship can be stated simply: type t in G corresponds to the propositional type t in $\mathcal{M}$; type e in G corresponds to the individual type e in $\mathcal{M}$; type ε in G corresponds to the eventuality type ε in $\mathcal{M}$ (see section 6.4 for typing of $\mathcal{M}$).

2. $laugh : j_e \multimap l_t$

The lexically contributed meaning constructors provide the premises for a linear logic proof of the expression's semantics. The linear logic provides the logic of semantic composition. A key feature of linear logic is that it is resource-sensitive: each premise in a linear logic proof must be used exactly once. The extraneous nature of a copy pronoun for semantic composition is thus reflected in the linear logic proof by the fact that the pronoun's lexically contributed premise is an extra resource which would otherwise go unused, leading to failure of the linear logic proof.

As noted above, the Curry-Howard isomorphism relates the linear logic proof steps to operations in the meaning language. A key Curry-Howard correspondence is between natural deduction implication elimination (*modus ponens*) and functional application, as demonstrated by the elimination rule for linear implication:

(131) Functional Application : Implication Elimination

$$\frac{\begin{array}{c}\vdots\\ a : A\end{array} \qquad \begin{array}{c}\vdots\\ f : A \multimap B\end{array}}{f(a) : B} \multimap_{\mathcal{E}}$$

With this implication elimination rule, including its Curry-Howard correspondence, we can perform the following proof for the semantics of (129):

(132) $$\frac{john : j_e \qquad laugh : j_e \multimap l_t}{laugh(john) : l_t} \multimap_{\mathcal{E}}$$

In the language of resource logic, we can say that the resource contributed by the lexical item *John* is consumed as the antecedent of the implicational resource contributed by the lexical item *laughed*. This consumption is modelled as implication elimination, which corresponds to functional application, thus yielding the expected meaning $laugh(john)$ for the sentence *John laughed*.

The complementary natural deduction rule for introducing implication corresponds, via the Curry-Howard isomorphism, to abstraction:

(133) Abstraction : Implication Introduction

$$\frac{\begin{array}{c}[x : A]^1\\ \vdots\\ f : B\end{array}}{\lambda x.f : A \multimap B} \multimap_{\mathcal{I},1}$$

The linear logic term A and its corresponding meaning term, the variable x, are introduced in a flagged assumption. The assumption is used to prove B, which corresponds to a functional meaning term. This justifies the inference $A \multimap B$, with abstraction over x in f, and the assumption is withdrawn.

Asudeh (2004), following Dalrymple et al. (1999b), assumes a variable-free analysis of pronouns: a pronoun is a function on its antecedent. However, due to the explicit resource accounting of linear logic, pronouns not only consume their antecedents to get their reference, they also produce the antecedent again, to make sure that it can still be used elsewhere in the semantics. A pronominal meaning constructor can be represented schematically as follows, where A is a term related to the antecedent and P is the pronoun's term.

(134) $\lambda y.y \times y : A \multimap (A \otimes P)$

The proof for example (135), shown in (136), illustrates the idea. The quantificational pronoun *everyone* has the standard type $\langle \langle e, t \rangle, t \rangle$. The Glue treatment of quantifiers is discussed further in section 6.4.2.

(135) Everyone$_1$ thinks he$_1$ left.

(136)

$$\dfrac{\lambda P.every(person,P) : \forall X.(e \multimap X) \multimap X \qquad \dfrac{\dfrac{\dfrac{\dfrac{[y:e]^1 \quad e \multimap (e \otimes p)}{y \times y : e \otimes p}\multimap_{\mathcal{E}} \qquad \dfrac{\dfrac{[u:e]^2 \quad e \multimap l \multimap t}{think(u) : l \multimap t}\multimap_{\mathcal{E}} \quad \dfrac{[v:p]^3 \quad p \multimap l}{leave(v) : l}\multimap_{\mathcal{E}}}{think(u, leave(v)) : t}\otimes_{\mathcal{E},2,3}}{\mathsf{let}\ y \times y\ \mathsf{be}\ u \times v\ \mathsf{in}\ think(u, leave(v)) : t}\Rightarrow_{\beta}}{think(y, leave(y)) : t}}{\lambda y.think(y, leave(y)) : e \multimap t}\multimap_{\mathcal{I},1}}{every(person, \lambda y.think(y, leave(y))) : t}\multimap_{\mathcal{E}}, [t/X]$$

This proof uses the rule for elimination of multiplicative conjunction ($\otimes$):

(137) Pairwise substitution : Conjunction Elimination

$$\dfrac{a : A \otimes B \qquad \begin{matrix}[x:A]^1 & [y:B]^2 \\ \vdots & \vdots \\ & f : C\end{matrix}}{\mathsf{let}\ a\ \mathsf{be}\ x\ \times\ y\ \mathsf{in}\ f : C}\otimes_{\mathcal{E},1,2}$$

where $\mathsf{let}\ a \times b\ \mathsf{be}\ x \times y\ \mathsf{in}\ f \ \Rightarrow_{\beta}\ f[a/x, b/y]$

Notice that the let constructor effects simultaneous pairwise substitution and corresponds to a structured functional application (Abramsky 1993, Benton et al. 1993, Crouch and van Genabith 2000). In sum, pronouns consume their antecedents to produce a conjunction of the antecedent resource with the pronominal resource.

Returning to the matter of copy raising as resumption, the manager resource contributed by the copy raising verb removes the pronominal resource from composition, thus performing a kind of resource management. This is sketched in the following linear logic proof:

(138)

$$\dfrac{\begin{matrix}\textbf{antecedent} \\ a : A_e\end{matrix} \qquad \dfrac{\begin{matrix}\textbf{pronoun} \\ \lambda y.y \times y : A_e \multimap (A_e \otimes P_e)\end{matrix} \qquad \dfrac{\begin{matrix}\textbf{manager resource} \\ \lambda f \lambda x.x : [A_e \multimap (A_e \otimes P_e)] \multimap (A_e \multimap A_e)\end{matrix} \qquad \lambda x.x : A_e \multimap A_e}{a : A_e}\multimap_{\mathcal{E}}}{a : A_e}\multimap_{\mathcal{E}}$$

The linear connectives used here are linear implication and multiplicative linear conjunction ($\otimes$). The lexically contributed premises are labelled with their contributors for clarity — this is not part of the proof per se. The proof for a quantificational antecedent instead involves an assumption of A in the second line, with the assumption subsequently discharged to form the scope of the quantifier, much as in (136); see (Asudeh 2004: 146) for details.

In this case, the pronoun never applies to the antecedent, because the manager resource consumes the entire pronominal resource. The result of this consumption is an identity function on the antecedent. The lexically contributed meaning constructors of the pronoun, its antecedent, and the manager resource are used in a linear logic proof that yields just the antecedent as a result. This occurs in two steps of implication elimination, each of which corresponds to functional application in the meaning language, via the Curry-Howard isomorphism. The manager resource thus resolves the problem of semantic composition arising from the pronoun saturating the position that licenses the non-expletive copy raising subject. The subject is then composed in place of the pronoun, by the copy raising verb that contributes the manager resource. The use of manager resources in copy raising unifies copy raising with resumptive pronouns in Asudeh's theory — a desired unification that had been impossible in previous literature (Potsdam and Runner 2001, Boeckx 2003).

In both cases of resumption, the mechanism that identifies the pronoun is normal anaphoric binding and the mechanism that enables proper semantic composition is the manager resource. In both cases, the binding equation and manager resource are lexically contributed — in this particular case, by the copy raising verb. The binding equation is shown in (139) and the meaning constructor for the manager resource is shown in (140):

(139) $(\uparrow \text{SUBJ})_\sigma = ((\uparrow \text{XCOMP GF}^+)_\sigma \text{ ANTECEDENT})$

(140) $\lambda f \lambda x.x : [(\uparrow \text{SUBJ})_\sigma \multimap ((\uparrow \text{SUBJ})_\sigma \otimes (\uparrow \text{XCOMP GF}^+)_\sigma)] \multimap [(\uparrow \text{SUBJ})_\sigma \multimap (\uparrow \text{SUBJ})_\sigma]$

The binding equation ensures that the copy pronoun in question must occur in the complement to the copy raising verb. The manager resource is specified in such a way that it consumes this pronoun, forming a function on the pronoun's antecedent, the non-expletive copy raising subject.

6.4 Semantics

6.4.1 Types

We adopt an event semantics (Davidson 1967, Higginbotham 1983, 1985, Parsons 1990, Kratzer 1995, 1996, 2003, Landman 2000) in which verbs have an implicit eventuality argument, where the set of eventualities is the union of the set of events and states, following Bach (1981). We will not spell out our entire logic, but rather the basic type theory (141) and the denotations of the types (142):

(141)
1. e, ϵ, ε, s, and t are types.
2. If σ and τ are types, then $\langle \sigma, \tau \rangle$ is a type.
3. Nothing else is a type.

(142)
1. The domain D_e of e is the set of individuals, A.
2. The domain D_t of t is the set of propositions, $\mathcal{P}(W)$ (the power set of the set of worlds).
3. The domain D_ϵ of ϵ is the set of events, E.
4. The domain D_s of s is the set of states, S.
5. The domain D_ε of ε is the set of eventualites, $E \cup S$.
6. The domain of a functional type $\langle \sigma, \tau \rangle$ is the set of all functions from D_σ to D_τ.

We adopt the following variable conventions:

(143)
1. For any type a, v_a, v'_a, v''_a, ... are type a variables.
2. x, y, z are type e variables over individuals.
3. P, Q are type $\langle e, t \rangle$ variables over properties.
4. p, q are type t variables over propositions.
5. e, e', e'', ... are type ϵ variables over events.
6. s, s', s'', ... are type s variables over states.
7. S, S', S'', ... are type $\langle s, t \rangle$ variables over state properties.

Note that we assume an intensional type theory without the intensional type s of, e.g., Montague (1973); we instead use the type s to stand mnemonically for states. The base type t stands for propositions rather than truth values (van Benthem 1988, 1991).

As discussed in section 5.2, we depart from typical Neo-Davidsonian treatments (e.g., Parsons 1990) in not treating verbs as one-place predicates on eventualities. Instead, we treat a verb as a relation with an eventuality argument and places for its arguments, as in Davidson (1967) and Dowty (1989). We treat thematic roles as further restrictions on the nature of these arguments. The verb *kiss* serves as an example:[19]

[19] We have defined the domain of type t as the power set of the set of worlds. We therefore define $\wedge$ and $=$ in set-theoretic terms as follows (note that '$=$' in the meta-language is standard set-theoretic equality):

(144) $\lambda x \lambda y \lambda e.kiss(e, x, y) \wedge \textsc{Agent}(e) = x \wedge \textsc{Theme}(e) = y$

The verb takes two individual-type arguments, x and y, and one event argument, e. The AGENT of e is restricted to be x and the THEME of e is restricted to be y. We thus adopt a mix of what Parsons (1990: 94) calls the "incorporation analysis" and the "independent conjunct analysis". We motivated this synthesis in section 5.

6.4.2 The core semantics of copy raising verbs and its implications

The basic meaning term that we assign copy raising verbs in their non-expletive subject subcategorization (i.e., true copy raising) — leaving aside PSOURCE and PGOAL for the moment and using *seem* to also stand for *appear* and Swedish *verka* ('seem') — is as follows (see (109) and (115) in section 6.1):

(145) $\lambda x \lambda P \lambda s.seem(s, P(x))$

The s argument is the verb's state argument, the second argument, P, is the property contributed by the predicative *like/as/som*-complement and the third argument, x, is the copy raising verb's subject.

It superficially seems that we are contradicting our claim that the copy raising subject is not an argument of the verb, since there is a lambda term in the verb's semantics that corresponds to the subject. However, notice that in the body of the verb's term there is no corresponding slot occupied by the copy raising subject's variable. The subject is therefore not a semantic argument of the copy raising verb (see section 5.3). Rather, the end result will be a proposition resulting from application of the *like/as/som*-complement's function to the copy raising subject's variable. Thus, again leaving aside PSOURCE and PGOAL for the moment and abstracting away from a fuller analysis of the *like/as/som*-complement (see Asudeh (2004: 383–386) for one possible analysis), the meaning for the examples in (146) is (147):[20]

(146) a. John seems/appears like/as if/as though he is upset.

b. John verkar som om han är upprörd.
J. seems as if he is upset

(147) $\exists s.seem(s, upset(john))$

The result of semantic composition is that, other than the eventuality argument, copy raising has a single, propositional argument, although this arises in composition through the application of the property contributed by the copy raising verb's complement to the non-expletive copy raising subject. In terms of the copy raising verb's denotational semantics, the subject is not a semantic argument, because the function $seem$ is evaluated with respect to only two arguments, the state argument s and the propositional argument $upset(john)$; neither of these arguments is the individual-type denotation of the subject.

Subject-to-subject raising *seem/appear/verka*, which are exemplified in (149) below, are assigned the basic lexical meaning term in (148), in this case leaving aside the existential closure of PSOURCE that is also lexically associated with the verb's entry (see section 6.1).

(148) $\lambda p \lambda s.seem(s, p)$

1. For expressions α, β such that $[\![\alpha]\!], [\![\beta]\!] \in D_t$, $[\![\alpha \wedge \beta]\!] = [\![\alpha]\!] \cap [\![\beta]\!]$.
2. Where α, β are of any type, $[\![\alpha = \beta]\!]$ is the set of worlds w such that $[\![\alpha]\!]^w = [\![\beta]\!]^w$.

[20] We make the standard assumption that the eventuality argument is by default existentially closed. There are a number of ways to formalize this Glue Semantics. Perhaps the most straightforward is to allow verbs to optionally contribute a meaning constructor of the form $\lambda S.\exists v_\varepsilon[S(v_\varepsilon)] : ((\uparrow_\sigma \textsc{evar}) \multimap \uparrow_\sigma) \multimap \uparrow_\sigma$, where EVAR is the verb's event argument resource. Alternatively a new structural rule could be introduced for event closure.

(149) Subject-to-subject raising (infinitival or predicative complement)

a. John seems/appears to be upset.

b. John seems/appears upset.

c. John verkar vara upprörd.
J. seems be.INF upset
'John seems to be upset.'

d. John verkar upprörd.
J. seems upset

The function for *seem/appear/verka* in (148) composes with a state argument, s, and a propositional argument, p. It does not compose with an argument corresponding to its subject, contrasting with the semantics for copy raising in (145). In these cases, the subject is therefore neither a compositional nor denotational argument of the raising verb.

We next turn to subcategorizations of *seem/appear/verka* with expletive or idiom chunk subjects. We make the standard assumption that expletives are non-contentful. It is useful to consider the consequences of this in light of the relationship between Glue Semantics and Categorial Grammar. In Categorial Grammar, expletives must nevertheless be assigned some interpretation, because the syntax of string composition (syntax in the general sense) and the syntax of semantic composition are not strictly separated. In other words, expletives must have some category and some semantic type (Carpenter 1997, Steedman 2005), otherwise they could not form part of the combinatory or logical derivation of a string's well-formedness and no strings with expletives could be generated. For example, in the type-logical Categorial Grammar tradition to which Glue Semantics is related, Carpenter (1997: 281–286) assigns the expletive *it* the base category ex_i and the expletive *there* the base category ex_t; Typ(ex_i) = Typ(ex_i) = **1**, where **1** is the unit type (for functions and products), which Curry-Howard corresponds to the propositional constant **true**.

Glue Semantics, in contrast, can make a simpler assumption, since it is based on an architectural assumption of a separated (though tightly related) syntax and semantics, as in the parallel projection architecture of LFG (Kaplan 1987, 1989, Asudeh 2006). String well-formedness is handled by an independent syntax (an LFG syntax in this case) and the commutative linear logic handles semantic composition. This means that the lack of semantic content of the expletive can be modelled directly: the expletive does not contribute a meaning constructor. The distribution of expletives is handled by the syntax and the expletive is not model-theoretically interpreted. Since there is no term in the meaning language $\mathcal{M}$, given the lack of model-theoretic interpretation of the expletive, there is no linear logic term in G that Curry-Howard corresponds to the expletive. A proof for example (150) is shown in (151).

(150) John said it rained.

(151)
$$\dfrac{\dfrac{john : j \qquad \dfrac{\lambda p\lambda x\lambda e.say(e,x,p) : r_t \multimap j_e \multimap event_\varepsilon \multimap s_t \qquad \exists e'[rain(e')] : r_t}{\lambda x\lambda e.say(e,x,\exists e'[rain(e')]) : j_e \multimap event_\varepsilon \multimap s_t}\multimap_\mathcal{E}}{\lambda e.say(e,john,\exists e'[rain(e')]) : event_\varepsilon \multimap s_t}\multimap_\mathcal{E}}{\exists e[say(e,john,\exists e'[rain(e')])] : s_t}\begin{matrix}\text{Event}\\ \exists\text{-clos.}\end{matrix}$$

Notice that there is no expletive term in this proof. The Glue Semantics treatment of expletives is largely equivalent to Carpenter's type-logical treatment, given the semantics of the unit type, but it keeps the type theory simpler and does not propose new base categories to handle expletives, which instead have the same syntactic category as other pronouns. This is preferable, since expletives syntactically distribute like other pronouns, for example occurring with any auxiliary in tag questions in (see, e.g., Pollard and Sag 1994: 250). The distribution of expletives is not correctly predicted by a special type-logical category and the special category introduces other complications to the grammar; for example, it would lead to otherwise unmotivated type redundancy for auxiliaries.

Subcategorizations of *seem/appear/verka* with expletive or idiom chunk subjects, as in (153), thus also have the meaning in (148), repeated here in (152):

(152) $\lambda p \lambda s.seem(s, p)$

(153) a. Subject-to-subject raising with expletive/idiom chunk subject

i. It seemed to be raining.

ii. There seemed to be a problem.

iii. The cat seemed to be out of the bag.

iv. Det verkade regna.
It seemed rain.INF
'It seemed to rain.'

v. Tärningen verkar som om den är kastad.
die.DEF seems as if it is cast
'The die seems as if it is cast.'

b. *That*-complement

i. It seems that John is upset.

c. Expletive-subject copy raising

i. It seem/appears like/as if/as though John is upset.

ii. Det verkar som om John är upprörd.
It seems as if J. is upset

iii. It seems/appears like/as if/as though there is a problem.

iv. There seems/appears like/as if/as though there is a problem.

v. The cat seems/appears like/as if/as though it is out of the bag.

In other words, all subcategorizations of *seem/appear/verka* other than non-expletive-subject copy raising share the meaning in (148)/(152), whether their subjects are raised or realized as expletives.

Therefore, all of the examples in (149) — including their expletive alternants in (153b) and (153c) — receive the following interpretation:

(154) $\exists s.seem(s, upset(john))$

Note that the proposition in (154) is precisely the same, again leaving PSOURCE and PGOAL aside, as the one in (147) for the related English and Swedish copy raising sentences in (146). However, we see that the identical propositions in (147) and (154) arise through different modes of composition. The non-expletive-subject copy raising subcategorization of *seem/appear/verka* builds its propositional argument up during composition, whereas other subcategorizations compose directly with their propositional argument.

Asudeh (2004: 388-391) shows that this difference in composition correctly predicts Lappin's (1984) observation (also see Potsdam and Runner 2001) that copy raising verbs cannot take scope over their subjects, unlike other raising verbs, which allow a wide/narrow-scope ambiguity:

(155) No runner seemed like she was exhausted.
For no runner x, x seemed like x was exhausted. *no* $>$ *seem*
* *seem* $>$ *no*

(156) No runner seemed to be exhausted.
For no runner x, x seemed to be exhausted. *no > seem*
It seemed to be the case that for no runner x, x was exhausted. *seem > no*

There is a valid linear logic proof for the wide scope quantifier reading of (155), as shown in Figure 1 on page 42. There is no valid proof for the narrow scope quantifier readings, as shown in Figure 2. In contrast, there is both a valid proof for the wide scope quantifier reading of (156), as shown in Figure 3, and for its narrow scope quantifier reading, as shown in Figure 4. The difference in composition between non-expletive-subject copy raising subcategorizations and other subcategorizations of the raising verbs in question is thus motivated by scope differences.

The compositional difference in scope possibilities for true copy raising versus other subcategorizations can be understood more generally. A quantifier in Glue Semantics has the standard generalized quantifier type $\langle\langle e, t\rangle, \langle\langle e, t\rangle, t\rangle\rangle$, as shown in the following meaning constructor:[21]

(157) $\lambda P \lambda Q.no(P, Q) : (v_e \multimap r_t) \multimap \forall X.(\alpha_e \multimap X_t) \multimap X_t$

The linear logic term $(v_e \multimap r_t)$ is the quantifier's restriction, corresponding to P in the meaning language. The linear logic term $(\alpha_e \multimap X_t)$ is the quantifier's scope, corresponding to Q in the meaning language. A simple derivation for (158) is shown in (159).

(158) No child frowned.

(159)
$$\dfrac{\dfrac{\lambda P \lambda Q.no(P, Q) : \quad child : \\ (v_e \multimap r_t) \multimap \forall X.(c_e \multimap X_t) \multimap X_t \quad v_e \multimap r_t}{\lambda Q.no(child, Q) : \forall X.(c_e \multimap X_t) \multimap X_t}\multimap\varepsilon \qquad frown : \\ c_e \multimap f_t}{no(child, frown) : f_t}\multimap\varepsilon, \forall\varepsilon[f/X]$$

In (159), the quantifier composes with its restriction and then composes with its scope. In composing with the scope, the variable X is instantiated to the scope's resource. This variable instantiation allows for scope underspecification and compact representation of scope ambiguity (Dalrymple et al. 1999b, Crouch and van Genabith 1999, van Genabith and Crouch 1999, Dalrymple 2001).

Any $\langle e, t\rangle$ linear logic term of the form $\beta_e \multimap \phi_t$ can serve as the quantifier's scope, $\alpha_e \multimap X_t$, so long as β_e and α_e are the same linear logic term and ϕ_t substitutes forX_t. Thus, in Figures 1 and 2, either the term $r_e \multimap s_t$ — which can be constructed from the term for the copy raising verb and a discharged assumption, as in Figure 1 — or the term $r_e \multimap e_t$ — which is the term for the copy raising verb's complement — could in principle serve as the scope of the quantifier. However, if the complement term $r_e \multimap e_t$ serves as the scope, then both the copy raising verb and the quantifier are seeking to consume the single resource that corresponds to this term. This leads to proof failure, given the resource sensitivity of linear logic, as shown in Figure 2. Thus, linear logic composition entails that the only possibility is for the quantifier to scope wide, consuming $r_e \multimap s_t$ as its scope. In contrast, the term for the other subcategorizations of raising, as seen in Figures 3 and 4, does not contain the term $r_e \multimap e_t$. Therefore, the quantifier can either consume $r_e \multimap e_t$ — taking narrow scope with respect to the raising verb, as in Figure 4 — or it can consume $r_e \multimap s_t$ — taking wide scope with respect to the raising verb as in Figure 3.

We can state the following theorem with respect to scope in Glue Semantics:

(160) Glue Semantics Scope Theorem 1:
If a functor takes a type $\alpha_e \multimap \phi_t$ argument, then that argument cannot also serve as the scope of a quantifier.

[21] Note that the universal quantifier, $\forall$, in the linear logic side is used only for scope underspecification. The denotation of the quantifier in the meaning language does not depend on the linear logic universal.

$$\dfrac{\dfrac{[y:r]^1 \qquad \lambda x\lambda P\lambda s.seem(s,P(x)) : r_e \multimap (r_e \multimap e_t) \multimap event_\varepsilon \multimap s_t}{\lambda P\lambda s.seem(s,P(y)) : (r_e \multimap e_t) \multimap event_\varepsilon \multimap s_t}\multimap_\mathcal{E} \qquad \begin{array}{c}\textbf{[Copy pronoun licensing]}\\ \vdots \\ \lambda z.\exists s'[exhausted(s',z)] : r_e \multimap e_t\end{array}}{\dfrac{\dfrac{\lambda s.seem(s,\exists s'[exhausted(s',y)]) : event_\varepsilon \multimap s_t}{\exists s[seem(s,\exists s'[exhausted(s',y)])] : s_t}\text{Event }\exists\text{-clos.}}{\lambda y.\exists s[seem(s,\exists s'[exhausted(s',y)])] : r_e \multimap s_t}\multimap_{\mathcal{I},1} \qquad no(runner) : \forall X.(r_e \multimap X_t) \multimap X_t}{no(runner,\lambda y.\exists s[seem(s,\exists s'[exhausted(s',y)])]) : s_t}\multimap_\mathcal{E},\ \forall_\mathcal{E}\text{[s/X]}}\multimap_\mathcal{E}$$

Figure 1: Valid proof for copy raising with wide-scope subject

$$\dfrac{\dfrac{[y:r]^1 \qquad \lambda x\lambda P\lambda s.seem(s,P(x)) : r_e \multimap (r_e \multimap e_t) \multimap event_\varepsilon \multimap s_t}{\lambda P\lambda s.seem(s,P(y)) : (r_e \multimap e_t) \multimap event_\varepsilon \multimap s_t}\multimap_\mathcal{E} \qquad \dfrac{\begin{array}{c}\textbf{[Copy pronoun licensing]}\\ \vdots \\ \lambda z.\exists s'[exhausted(s',z)] : r_e \multimap e_t\end{array} \qquad no(runner) : \forall X.(r_e \multimap X_t) \multimap X_t}{no(runner,\lambda z.\exists s'[exhausted(s',z)]) : e_t}\multimap_\mathcal{E},\ \forall_\mathcal{E}\text{[e/X]}}{\textbf{Fail}}$$

Figure 2: No valid proof for copy raising with narrow-scope subject

$$\dfrac{\dfrac{\lambda p\lambda s.seem(s,p) : e_t \multimap event_\varepsilon \multimap s_t \qquad \dfrac{[x:r_e]^1 \qquad \lambda y.\exists s'[exhausted(s',y)] : r_e \multimap e_t}{\exists s'[exhausted(s',x)] : e_t}\multimap_\mathcal{E}}{\lambda s.seem(s,\exists s'[exhausted(s',x)]) : event_\varepsilon \multimap s_t}\multimap_\mathcal{E}}{\dfrac{\exists s[seem(s,\exists s'[exhausted(s',x)])] : s_t}{\lambda x.\exists s[seem(s,\exists s'[exhausted(s',x)])] : r_e \multimap s_t}\text{Event }\exists\text{-clos.}\multimap_{\mathcal{I},1} \qquad \begin{array}{c}no(runner) :\\ \forall X.(r_e \multimap X_t) \multimap X_t\end{array}}{no(runner,\lambda x\exists s[seem(s,\exists s'[exhausted(s',x)])]) : s_t}\multimap_\mathcal{E},\ \forall_\mathcal{E}\text{[s/X]}$$

Figure 3: Valid proof for subject-to-subject raising with wide-scope subject

$$\dfrac{\dfrac{\lambda p\lambda s.seem(s,p) : e_t \multimap event_\varepsilon \multimap s_t \qquad \dfrac{\lambda x.\exists s'[exhausted(s',x)] : r_e \multimap e_t \qquad \begin{array}{c}no(runner) :\\ \forall X.(r_e \multimap X_t) \multimap X_t\end{array}}{no(runner,\exists s'[exhausted(s',x)]) : e_t}\multimap_\mathcal{E},\ \forall_\mathcal{E}\text{[e/X]}}{\lambda s.seem(s,no(runner,\exists s'[exhausted(s',x)])) : event_\varepsilon \multimap s_t}\multimap_\mathcal{E}}{\exists s[seem(s,no(runner,\exists s'[exhausted(s',x)]))] : event_\varepsilon \multimap s_t}\text{Event }\exists\text{-clos.}$$

Figure 4: Valid proof for subject-to-subject raising with narrow-scope subject

This theorem entails that in true copy raising the subject of the copy raising verb must take wide scope with respect to the verb.

The compositional scheme for copy raising, repeated below as (161), is strikingly similar to Asudeh's (2005a) treatment of control verbs with a propositional argument, shown in (162):[22]

(161) $\lambda x \lambda P \lambda s.seem(s, P(x))$

(162) $\lambda x \lambda P \lambda e.try(e, x, P(x))$

Again, the resulting propositional argument is built out of a property and an individual variable: the control verb applies the property's function to the individual in composition. One of the consequences of this composition scheme is that the wide scope of controllers relative to control verbs (Montague 1973, Dowty et al. 1981) is similarly predicted (Asudeh 2005a: 489–491). Asudeh (2005a) shows that the very same composition scheme can yield a property denotation by not applying the property to the controller. The scope results still hold, though, because they are based solely on the verb composing separately with an individual and a property, which holds true no matter whether application is taking place inside the verbal term or not. The compositional treatment of wide-scope subjects is thus very general.

True copy raising categorizations of raising verbs thus share commonalities with both control verbs and 'canonical raising' (i.e., raising verbs in subcategorizations other than non-expletive-subject copy raising):

(163) $\lambda p \lambda s.seem(s, p)$ canonical raising

(164) $\lambda x \lambda P \lambda s.seem(s, P(x))$ true copy raising

(165) $\lambda x \lambda P \lambda e.try(e, x, P(x))$ control

In the term for canonical raising, the body of the verbal function contains two slots for semantic arguments. One slot is occupied by the verb's eventuality (state) argument, s, and the other by the verb's propositional argument, p. As alluded to in passing above, we call an argument that occupies a slot in the verbal function a *denotational argument*, since the denotation of the verb in the model is a function on the denotations of these arguments. In the term for the copy raising verb in (164), the body of the verbal function also contains two slots for semantic arguments. As discussed above, the result of composition for copy raising will be that a proposition occupies the second slot. Thus, the term for canonical raising and the term for true copy raising are identical with respect to their denotational arguments: both have one argument that is the state argument and a second argument that is a proposition.

In contrast, the control verb meaning in (165) has three argument slots and therefore has three denotational arguments. These are the eventuality (event) argument, e, the controller argument, x, and the propositional argument corresponding to the controlled complement, where the last argument arises in composition through application of P to x. Thus, with respect to denotational arguments, the copy raising verb and the control verb are distinct. Where they are similar is in how they compose with their arguments. Let us call a lambda-bound variable in a meaning term a *compositional argument*, since these are the arguments that the lambda term combines with through functional application in composition. The copy raising verb and the control verb each have three compositional arguments. In particular, the copy raising subject and the subject of the subject control verb are both compositional arguments. However, only the subject of the control verb is also a denotational argument.

We thus see that for control and canonical raising, there is a tight match between denotational arguments and compositional arguments. The term for canonical raising in (163) composes with two arguments and these are its denotational arguments. The control verb composes with three arguments and these are likewise its denotational arguments. The term for true copy raising, however, introduces a mismatch between compositional and denotational

[22] Asudeh (2005a) does not adopt event semantics and his meaning for *try* therefore has no event variable. We have inserted one here for parity with the rest of our semantics.

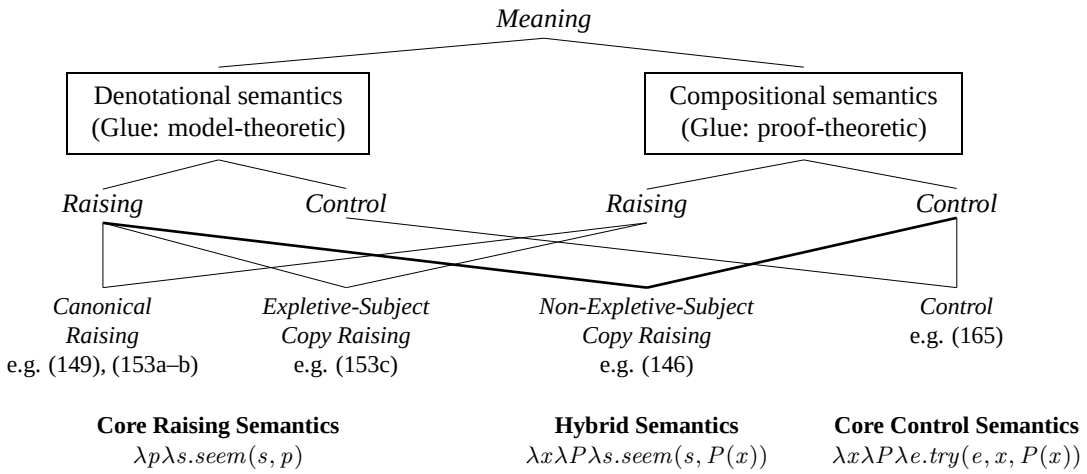


Figure 5: Semantics of control and raising

arguments. Like a subject control verb, the copy raising verb has three compositional arguments, corresponding to its eventuality argument, its subject, and its predicative complement. However, like a canonical raising verb it has only two denotational arguments, where the second, propositional argument is built up out of two of its compositional arguments. The term for non-expletive-subject copy raising thus constitutes a kind of hybrid meaning.

The overall picture is summarized in Figure 5. This figure shows that if we look at the semantics of control and raising in two dimensions, according to its denotational aspect (model-theoretic in Glue) and compositional aspect (proof-theoretic in Glue), there is generally a tight correspondence between the two dimensions. However, copy raising constitutes a hybrid semantic category, having the compositional semantics of control, but the denotational semantics of raising.

6.4.2.1 Summary

We have situated the semantics of the true copy raising subcategorization of English *seem/appear* and Swedish *verka* within the semantics of control and canonical raising. We showed that copy raising shares aspects of both classic control and raising. True copy raising is like control in how it composes with its clausal complement: the verb applies the functor corresponding to its complement to an individual-type variable that corresponds to one of its syntactic arguments — the non-expletive copy raising subject or the controller. Copy raising is like canonical raising in that the result of the composition is a proposition and this proposition is the sole denotational argument other than the eventuality argument; that is, the copy raising subject never plays a role in model-theoretic interpretation, except with respect to PSOURCE, which we return to in the next section. This also sheds further light on what is meant by the claim that a copy raising subject is not a semantic argument of the copy raising verb: the subject is not a denotational argument of the verb, but it is a compositional argument. The semantics of copy raising thus points to a subtler understanding of the general semantics of control and raising in which issues of composition must be teased apart from issues of denotation.

The mismatch between compositional and denotational arguments in true copy raising itself deserves further study. One research question that arises is whether this mismatch could form the basis for an account of why it is that certain speakers acquire grammars of copy raising in which copy pronouns are not necessary. Perhaps these speakers have resolved the mismatch between the compositional and denotational arguments of copy raising by making the subject a denotational as well as compositional argument. For these speakers, the semantics of copy raising would be more like the semantics of control. It would then also be interesting to see if there are other speakers who have resolved

the mismatch in the opposite way, by not treating the copy-raised subject as a compositional argument, since it is not a denotational argument. Given Asudeh's analysis of copy raising based on semantic composition, which we have adopted, the prediction is that for such speakers true copy raising per se would be entirely ungrammatical, since the licensing of the copy raising subject rests on its composition in the place of the copy pronoun and this in turn rests on the subject being a compositional argument of the copy raising verb. These speakers would then be predicted to lack copy raising but to allow expletive examples of the form *It seems like* .... Such speakers could possibly also allow alternants with idiom chunk subjects and *there*-expletive subjects (*There seems like* ...), depending on other lexical facts about their grammars (Asudeh 2004: 377–383).

6.4.3 The semantics of PSOURCE and PGOAL

We define the semantic role PSOURCE as follows:[23]

(166) PSOURCE is a partial function from eventualities to eventualities or individuals.

$$\textsc{Psource} : D_\varepsilon \rightharpoonup (D_\varepsilon \cup D_e)$$

The uniqueness requirement on PSOURCE generally follows from its definition as a partial function: If an eventuality has a PSOURCE, then it has only one PSOURCE denotation.

We can now add the PSOURCE information to the partial semantics for copy raising developed in section 6.4.2. A copy raising verb has the following interpretation (using English as the meta-language for both English and Swedish object languages):

(167) $\lambda x \lambda P \lambda s.seem(s, P(x)) \wedge \textsc{Psource}(s) =_t x$

The copy raising verb applies to its subject and composes the subject with its one argument, the property corresponding to the *like*/*as*/*som*-complement. The copy raising verb also contributes a PSOURCE and requires that its subject is the PSOURCE.

Notice that PSOURCE attribution involves a particular kind of equality, which we define as follows:

(168) If α and β have the same type, then $[\![\alpha =_t \beta]\!] = [\![\alpha = \beta]\!]$.
Otherwise, $[\![\alpha =_t \beta]\!]$ is undefined.

Thus, $=_t$ is a standard typed equality (Martin-Löf 1984, Turner 1996, 1997), which yields a kind of partial equality. In particular, unlike standard equality, $=_t$ is undefined if two disjoint types are equated, rather than false (the empty set; see footnote 19). This typed equality will play a role in our treatment of certain key facts about *på*-PPs and the puzzle of the absent cook.

English and Swedish copy raising sentences like those in (169) receive the interpretation in (170), leaving aside a number of details, including tense, the interpretation of *like*/*as*/*som*, and the composition of the copy raising verb's complement:

(169) a. Tom seems like he is laughing.

b. Tom verkar som om han skrattar.
T. seems as if he laughs
'Tom seems as if he is laughing.'

[23] In this section and the following section we leave aside the corresponding linear logic terms in our semantics for simplicity's sake. These can be found in section 6.1 and can also be easily reconstructed from the meaning terms below, given the Curry-Howard isomorphism. Also, see the appendix for two full Glue derivations.

(170)
$$\dfrac{\dfrac{\dfrac{tom \qquad \lambda x\lambda P\lambda s.seem(s,P(x)) \wedge \textsc{Psource}(s) =_t x}{\lambda P\lambda s.seem(s,P(tom)) \wedge \textsc{Psource}(s) =_t tom} \qquad \begin{array}{c}\vdots\\ \lambda y.\exists e[laugh(e,y) \wedge \textsc{Agent}(e) = y]\end{array}}{\lambda s.seem(s,\exists e[laugh(e,tom) \wedge \textsc{Agent}(e) = tom]) \wedge \textsc{Psource}(s) =_t tom}}{\exists s[seem(s,\exists e[laugh(e,tom) \wedge \textsc{Agent}(e) = tom]) \wedge \textsc{Psource}(s) =_t tom]}$$

We make the standard assumption of existential closure of the eventuality variable in the absence of other quantification.

PSOURCE was defined in (166) as a partial function from eventualities. However, all *perceptual* eventualities — eventualities involved in perceptual reports — must have a source of perception, i.e. something that is perceived. To capture this, we make PSOURCE a total function on perceptual eventualities:

(171) PSOURCE is a total function from perceptual eventualities to eventualities or individuals:

PSOURCE : $P \rightarrow (D_\varepsilon \cup D_e)$, where P is the set of perceptual eventualities and $P \subseteq D_\varepsilon$.

Perceptual eventualities must equally have a perceiver, i.e. what we have called a PGOAL. We define PGOAL similarly to PSOURCE, as a partial function on eventualities in general and as a total function on perceptual eventualities:

(172) PGOAL is a partial function from eventualities to individuals.

PGOAL : $D_\varepsilon \rightharpoonup D_e$

PGOAL is a total function from perceptual eventualities to individuals:

PGOAL : $P \rightarrow D_e$, where P is the set of perceptual eventualities and $P \subseteq D_\varepsilon$.

Note that the PGOAL function returns only individuals, since only individuals can be perceivers.

PGOALs now have to be added to our semantics for *seem/appear* and *verka*. English can express the PGOAL as a *to*-PP adjunct and this can occur in all of the alternations we have looked at. The interpretation of *to* in this usage is shown in (173).[24] A proof for example (174) is shown in (175).

(173) $\lambda x\lambda S\lambda s.S(s) \wedge \textsc{Pgoal}(s) = x$

(174) Tom seems to Mary like he is laughing.

(175)
$$\dfrac{\dfrac{\dfrac{\dfrac{tom \qquad \lambda x\lambda P\lambda s'.seem(s',P(x)) \wedge \textsc{Psource}(s') =_t x}{\lambda P\lambda s'.seem(s',P(tom)) \wedge \textsc{Psource}(s') =_t tom} \qquad \begin{array}{c}\vdots\\ \lambda y.\exists e[laugh(e,y) \wedge \textsc{Agent}(e) = y]\end{array}}{\lambda s'.seem(s',\exists e[laugh(e,tom) \wedge \textsc{Agent}(e) = tom]) \wedge \textsc{Psource}(s') =_t tom} \qquad \dfrac{mary \quad \lambda x\lambda S\lambda s.S(s) \wedge \textsc{Pgoal}(s) = x}{\lambda S\lambda s.S(s) \wedge \textsc{Pgoal}(s) = mary}}{\lambda s.seem(s,\exists e[laugh(e,tom) \wedge \textsc{Agent}(e) = tom]) \wedge \textsc{Psource}(s) =_t tom \wedge \textsc{Pgoal}(s) = mary}}{\exists s[seem(s,\exists e[laugh(e,tom) \wedge \textsc{Agent}(e) = tom]) \wedge \textsc{Psource}(s) =_t tom \wedge \textsc{Pgoal}(s) = mary]}$$

Notice that (174) is simply (170) with the addition of PGOAL composition. Since PGOAL is a function, we correctly predict the impossibility of having two denotationally distinct PGOAL PP adjuncts:

(176) *Tom seemed tired to me to you.

Notice that since PGOAL only returns individuals, we use simple equality in (173).

Swedish can express PGOAL as an object, in certain circumstances. It is standardly possible with the infinitival raising verb *tyckas* and it is also possible for some speakers with the verb *verka*. This was show in (41) and (42), which are repeated here:

[24] The corresponding linear logic term is identical to the one for Swedish *på*, shown in (116) in section 6.1.

(177) % Tom verkade mig som om han hade vunnit.
T. seemed me as if he had won
'Tom seemed to me as if he had won.'

(178) Tom tycktes mig ha vunnit.
T. seemed me have.INF won
'Tom seemed to me to have won.'

Since the Swedish PGOAL is an object, it is inappropriate to extend the adjunct analysis of the English *to*-PP to Swedish *mig* in (177–178). Instead, these could be added to the lexically contributed meanings of the Swedish verbs themselves, equivalently to how the PSOURCE contributed by a non-expletive copy-raised subject was treated in (167). The meanings for Swedish copy raising *verka* (for speakers who allow the object PGOAL) would be (179) and the meaning for standard raising *tyckas* and *verka* would be (180):

(179) $\lambda y \lambda x \lambda P \lambda s.seem(s, P(x)) \wedge \textsc{Psource}(s) =_t x \wedge \textsc{Pgoal}(s) = y$

(180) $\lambda x \lambda p \lambda s.seem(s, p) \wedge \textsc{Pgoal}(s) = x$

Notice that these meanings reflect the differing modes of composition for copy raising and infinitival raising that were motivated in section 6.4.2 and the fact that *tyckas*, which is not a copy raising verb, does not lexically contribute a PSOURCE.

We capture the requirement that all perceptual eventualities have a perceived PSOURCE and a perceiver PGOAL with the following meaning postulate:

(181) $\forall v_\varepsilon \exists v' \exists x \Box [v_\varepsilon \in P \rightarrow \textsc{Psource}(v_\varepsilon) =_t v' \wedge v' \in (D_\varepsilon \cup D_e) \wedge \textsc{Pgoal}(v_\varepsilon) = x]$

This meaning postulate has consequences for the analysis of non-copy-raising alternants of the raising verbs concerned. In particular, the question arises as to whether the non-copy-raising alternants also denote perceptual eventualities. This would be a welcome result, because it would mean that the raising verbs *seem/appear/verka* denote perceptual eventualities in general, rather than the copy raising alternant doing so exceptionally. Then this meaning postulate should apply to the verbs in general, not just to their copy raising alternant. In section 6.4.3.2, we present empirical evidence from Swedish that impinges on this question. First, though, we present a solution to the *på* puzzle.

6.4.3.1 A solution to the *på* puzzle

The Swedish *på*-PP adjunct contributes a PSOURCE to the eventuality that it modifies. We assigned the preposition *på* in this use the following meaning (see (116) in section 6.1.2):

(182) $\lambda x \lambda S \lambda s.S(s) \wedge \textsc{Psource}(s) =_t x$

Swedish *på*-PPs are thus similar to English *to*-PPs, except that they contribute a PSOURCE instead of a PGOAL.

The ungrammaticality of Swedish copy raising with a *på*-PP adjunct — the *på* puzzle — follows from the presence of two PSOURCEs — one contributed by the copy raising verb and one contributed by the *på*-PP adjunct. The relevant part of the semantic derivation for (183) is shown in (184):[25]

(183) * Tom verkar på Robin som om han skrattar.
T. seems on R. as if he laughs

[25] We have curried the $seem$ function so that we can leave aside the verb's composition with its complement.

(184)
$$\frac{\begin{array}{cc}\vdots & \vdots \\ \lambda s'\lambda P.seem(s', P(tom)) \wedge \textsc{Psource}(s) =_t tom & \lambda S\lambda s.S(s) \wedge \textsc{Psource}(s) =_t robin\end{array}}{\lambda s\lambda P.seem(s, P(tom)) \wedge \textsc{Psource}(s) =_t tom \wedge \textsc{Psource}(s) =_t robin}$$

The uniqueness requirement for PSOURCEs (see (50) in section 4 above) blocks such cases: the specification of two denotationally distinct PSOURCEs is impossible, due to PSOURCE denoting a function.

6.4.3.2 Existential closure of PSOURCE

In discussing the meaning postulate (181) that requires perceptual eventualities to have PSOURCEs and PGOALs, we raised the question of whether the raising verbs that occur in copy raising always denote perceptual eventualities or whether they do so only in their non-expletive-subject copy raising alternants. We return to this matter now.

Evidence from Swedish suggests that the copy raising verb *verka* also denotes a perceptual eventuality in its subject-to-subject raising alternant, i.e. when it functions as a canonical raising verb. The cases of interest are instances of subject-to-subject raising *verka* with a *på*-PP, which speakers find quite odd:

(185) # Maria verkar på Jonas ha skrattat.
M. seems on J. be happy.

Recall from section 2 that in subject-to-subject raising, the subject of the raising verb is not tied to the perceptual source interpretation, since such sentences can be felicitous in the absence of the individual in question (i.e., subject-to-subject raising does not give rise to the puzzle of the absent cook). Example (185) is thus not ruled out because of a PSOURCE clash between *Maria* and *Jonas*.

This otherwise puzzling data is explained if the verb has an existentially bound PSOURCE. The meaning for (185) would then be:

(186) $\exists s\exists v_\varepsilon[seem(s, \exists e[laugh(e, jonas) \wedge \textsc{Agent}(e) = jonas]) \wedge \textsc{Psource}(s) =_t v_\varepsilon \wedge \textsc{Psource}(s) =_t jonas]$

The subject-to-subject raising verb contributes the existential closure of PSOURCE and the *på*-PP contributes the PSOURCE *jonas*. Notice that the existential closure is over an eventuality variable of type ε. Thus, in contrast to copy raising and the *på*-PP, which respectively require their individual-denoting subject or complement to be the PSOURCE, this existential closure treats the source of perception as an eventuality. Eventualities and individuals belong to distinct domains in our theory (see (142) above). Therefore instantiation of the existential quantification over v_ε must return an eventuality, which is clearly denotationally distinct from the individual denotation for $jonas$. Examples like (185) with an existentially closed PSOURCE as well as a *på*-PP PSOURCE are therefore also blocked by the uniqueness requirement on PSOURCE.

The typed equality, $=_t$, has another interesting consequence. By substitution in the equality for PSOURCE in (186), we get:

(187) $v_\varepsilon =_t jonas$

As noted above, the existentially bound variable v_ε has type ε while $jonas$ has type e. The typed equality is defined such that if it evaluates distinct types the result is undefined (see its definition in (168) above). Therefore, the relevant sub-proposition of (186), shown in (188), has no truth value:

(188) $\ldots \wedge \textsc{Psource}(s) =_t v_\varepsilon \wedge \textsc{Psource}(s) =_t jonas$

As a result, the proposition (186) for sentence (202) as a whole lacks a truth value. The infelicity of (185) is thus modelled as akin to presupposition failure, which reflects speakers' intuitions that the sentence is quite odd, if not

precisely ill-formed. In sum, although there is no PSOURCE clash between *Maria* and *Jonas* in (185), there is a PSOURCE clash between the existentially bound PSOURCE and the *Jonas* PSOURCE.

The Swedish data thus indicates that *verka* in general contributes a PSOURCE and denotes a perceptual eventuality, not just in its copy raising alternant. We do not have direct evidence that English subject-to-subject raising involves an existentially bound PSOURCE, but it is reasonable to assume parity with Swedish, given the lack of evidence to the contrary and given the general similarities between English and Swedish raising.[26]

Existential closure is further supported by felicitous expletive-subject sentences in the absent cook scenario:

> A and B walk into Tom's kitchen. There's no sign of Tom, but there are various things bubbling away on the stove and there are several ingredients on the counter, apparently waiting to be used.

(189) It seems that Tom is cooking.

(190) It seems like Tom is cooking.

(191) Det verkar som om Tom lagar mat.
It seems as if T. makes food
'It seems as if Tom's cooking.'

In this case, the PSOURCE is the state of the kitchen. Notice that expletive-subject copy raising is felicitous in this scenario, even though non-expletive-subject copy raising is not.

If we treat such expletive examples as having an existentially bound PSOURCE, then we can maintain a general perceptual semantics for *seem* in all alternations. We must, however, make the further assumption that the existential closure is obligatory in English expletive examples, but only optional in Swedish, since Swedish allows a *på*-PP expression of the PSOURCE to co-occur with an expletive subject, as in (48) and the following example:

(192) Det verkar på Per som om Maria är glad.
it seems on P. as if M. is happy
$\sim$'Per gives the impression that Maria is happy.'

However, when the *på*-PP is absent, as in (193), the existential closure is obligatory. Our analysis therefore assigns the following Swedish sentence the same broad interpretation as English (190) above:

(193) Det verkar som om Tom lagar mat.
it seems as if T. makes food
'It seems as if Tom is cooking.'

Thus, expletive examples involve existential closure of the PSOURCE; this operation is obligatory in English and optional in Swedish.

In sum, the pattern of PSOURCE expression in English and Swedish is as follows:

1. English and Swedish true copy raising: The non-expletive copy-raised subject is the PSOURCE.
2. English and Swedish subject-to-subject raising: The PSOURCE is obligatorily existentially closed.
3. Expletive subjects (including expletive-subject copy raising):
   (a) English: The PSOURCE is obligatorily existentially closed
   (b) Swedish: The PSOURCE is optionally existentially closed.

[26] This leaves the matter of English *seem*/*appear* with *that*-complements. It is possible that in this alternant the PSOURCE is entirely absent. This is discussed further in the conclusion (section 7).

We can thus see that one principal typological difference between the two languages with respect to PSOURCE realization lies in whether existential closure of the PSOURCE is obligatory or only optional in expletive examples. The evidence for this difference comes from another typological difference, which is the capacity of Swedish to alternatively express the PSOURCE in a *på*-PP adjunct.

Some avenues for further research suggest themselves at this point. The first concerns optional existential closure of PSOURCE in Swedish expletive examples. This is a stipulation that is descriptively accurate, but not really satisifying as an explanation. In particular, why is it that the existential closure is obligatory in subject-to-subject raising but only optional in the expletive subject case? The second issue for further research concerns the status of PGOAL. In the absence of other information (e.g., a *to*-PP in English), the speaker seems to fill the role of PGOAL. However, it is a legitimate question whether this is an entailment, with the PGOAL being equated in the semantics with the speaker index. Alternatively, the information that the speaker is the PGOAL could be a presupposition or conventional implicature, with the the PGOAL being existentially closed in the semantics on a par with PSOURCE.

We now turn to a formal analysis of the existential closure cases, turning first to subject-to-subject raising, which involves existential closure of the PSOURCE in both English and Swedish; the interpretation is shown in (194). We represent the core verbal semantics and the existential closure separately, as this will facilitate discussion of subcategorizations with expletive examples below.

(194) 1. $\lambda p \lambda s'.seem(s', p)$

2. $\lambda S \lambda s. \exists v_\varepsilon [S(s) \wedge \textsc{Psource}(s) =_t v_\varepsilon]$

Recall that, in contrast to copy raising, subject-to-subject raising takes a propositional complement that has already combined with the raised subject. This again has to do with the copy pronoun, but also underlies how Asudeh (2004) derives the differing scopal behaviour of copy raising and subject-to-subject raising (Lappin 1984), as discussed in section 6.4.2.

The equivalent English and Swedish subject-to-subject raising sentences in (195) receive the interpretation in (196):

(195) a. Tom seemed to laugh.

b. Tom verkade skratta.
T. seemed laugh.INF
'Tom seemed to laugh.'

(196)
$$\dfrac{\dfrac{\dfrac{\lambda p \lambda s'.seem(s', p) \qquad \vdots \quad \exists e[laugh(e, tom) \wedge \textsc{Agent}(e) = tom]}{\lambda s'.seem(s', \exists e[laugh(e, tom) \wedge \textsc{Agent}(e) = tom]) \qquad \lambda S \lambda s. \exists v_\varepsilon [S(s) \wedge \textsc{Psource}(s) =_t v_\varepsilon]}}{\lambda s. \exists v_\varepsilon [seem(s, \exists e[laugh(e, tom) \wedge \textsc{Agent}(e) = tom]) \wedge \textsc{Psource}(s) =_t v_\varepsilon]}}{\exists s \exists v_\varepsilon [seem(s, \exists e[laugh(e, tom) \wedge \textsc{Agent}(e) = tom]) \wedge \textsc{Psource}(s) =_t v_\varepsilon]}$$

There is a perceptual source contributed in these sentences, but its precise identity is left unspecified beyond that it is an eventuality; something is the source of perception and that something is an eventuality. In this case, for example, it could be an event of Tom making some oral noise. Although the exact nature of the PSOURCE is left underspecified in subject-to-subject raising, there is nonetheless a PSOURCE contributed by the verb. Thus, we correctly predict that Swedish subject-to-subject raising cannot occur with a *på*-PP due to the type conflict between v_ε and the individual-type object of the *på*-PP, as discussed above in relation to example (185).

The last case to consider is that of occurrences of *seem/appear/verka* with expletive subjects, whether expletive-subject copy raising subcategorizations or other subcategorizations. In English, this involves obligatory existential

closure and it is therefore equivalent to the subject-to-subject raising case. In Swedish, the existential closure is only optional, since expletive examples can occur with or without a *på*-PP. Examples (197) demonstrates English expletive examples and Swedish expletive examples and their shared interpretation. Example (198) demonstrates a Swedish expletive example with a *på*-PP and its interpretation on the reading where *Tom* and *han* are co-referential.

(197) a. It seems that Tom is laughing.

b. It seems like Tom is laughing.

c. Det verkar som om Tom skrattar.

$\exists s \exists v_\varepsilon [seem(s, \exists e[laugh(e, tom) \wedge \textsc{Agent}(e) = tom]) \wedge \textsc{Psource}(s) =_t v_\varepsilon]$

(198) Det verkar på Tom som om han skrattar.
$\exists s [seem(s, \exists e[laugh(e, tom) \wedge \textsc{Agent}(e) = tom]) \wedge \textsc{Psource}(s) =_t tom]$

The interpretation of (197) is the same as the subject-to-subject raising case in (195–196). In particular, the PSOURCE in both cases is existentially closed and is an eventuality. The interpretation of (198) is the same as the interpretation of (169a–b), shown in (170).

6.4.3.3 A solution to the puzzle of the absent cook

Let us now return to the puzzle of the absent cook to see how our semantics for PSOURCE solves the puzzle. First, consider the scenario in which Tom is present and any of the utterances in (200) by A to B is felicitous:

(199) A and B walk into Tom's kitchen. Tom is at the stove doing something, but exactly what is a little unclear.

(200) a. Tom seems to be cooking.

b. It seems like Tom's cooking.

c. Tom seems like he's cooking.

Our semantics assigns the first two sentences an existentially bound eventuality PSOURCE. The impression is conveyed by some eventuality, presumably the state of the kitchen. In the last sentence, the speaker is making the more specific claim that it is Tom who is the source of the perception. The PSOURCE function in this case returns the individual Tom and since the subject denotes the individual Tom, the sentence is true.

Now consider the scenario where Tom is absent, in which the copy raising sentence is no longer felicitous:

(201) A and B walk into Tom's kitchen. There's no sign of Tom, but there are various things bubbling away on the stove and there are several ingredients on the counter, apparently waiting to be used.

(202) a. Tom seems to be cooking.

b. It seems like Tom's cooking.

c. #Tom seems like he's cooking.

In this scenario, the PSOURCE function cannot return Tom, because Tom is not present in the state that it applies to. The likeliest actual PSOURCE in this scenario is the state of the kitchen, a type s state, and the expression $\textsc{Psource}(s) =_t tom$ has to be evaluated with the first argument of type s and the second of type e. Given our definition of $=_t$ in (168), the result of evaluating $=_t$ with arguments of different types is undefined. Therefore, the conjunction $seem(s, \ldots) \wedge \textsc{Psource}(s) =_t tom$ cannot be assigned a truth value. The presupposition that Tom is the PSOURCE therefore fails. This correctly predicts that the negation of (202c) is equally infelicitous in this scenario, if the PSOURCE is the state of the kitchen or any other non-individual type:

(203) #Tom doesn't seem like he's cooking.

Our account thus solves the puzzle of the absent cook and treats the infelicity of copy raising in the absence of perceptual evidence of the subject as presupposition failure, according to a simple Strawsonian notion of presupposition failure as meaninglessness through lack of a truth value (Strawson 1950, 1964).[27]

This contrasts with a scenario that we have not so far considered in which there is an individual present to serve as a PSOURCE, but it is not the individual named in the sentence (and both A and B know that the two individuals are not the same):

(204) A and B walk into Tom's kitchen. Robin is at the stove doing something, but exactly what is a little unclear. A and B recognize Robin and know that Robin is not Tom.

(205) a. A: Tom seems like he's cooking.

In this scenario, our analysis treats this sentence as simply false. The PSOURCE is Robin, not Tom, and since Robin and Tom are both of the same type (e), then $\textsc{Psource}(s) =_t tom$ is defined as $robin = tom$, which does not include the world of the scenario.

6.4.4 Summary

We have presented a semantics for the semantic roles PSOURCE and PGOAL which treats both as partial functions on eventualities (total functions on perceptual eventualities). The non-expletive-subject copy raising subcategorization of *seem/appear/verka* lexically specifies that the copy raising subject is the PSOURCE. The adjunct *på*-PP in Swedish also contributes a PSOURCE. English *to*-PP adjuncts contribute a PGOAL. We showed that the PSOURCE semantics provides solutions to the *på*-puzzle and the puzzle of the absent cook.

One final feature of our PSOURCE semantics is that it explains another puzzling contrast between subject-to-subject raising and copy raising. Namely, the classic equivalence between (206a) and (206b) in subject-to-subject raising (Rosenbaum 1967) does not hold for copy raising, as shown in (207).[28]

(206) a. Bush seemed to control Congress.

b. $\equiv$ The Congress seemed to be controlled by Bush.

(207) a. Bush seemed as if he controlled Congress.

b. $\not\equiv$ Congress seemed as if Bush controlled them.

In (206a) and (206b), the PSOURCE is an existentially bound eventuality in both cases. This captures the synonymy of the two cases, given that any event in which the doctor examines John is one in which John is examined by the doctor. In contrast, (207a) and (207b) have distinct PSOURCEs: the PSOURCE of (207a) is $bush$, whereas the PSOURCE of (207b) is $congress$.

6.5 Perceptual resemblance verbs

Perceptual resemblance verbs pattern similarly to copy raising, but recall that a key difference is that the perceptual resemblance verbs do not require a copy pronoun in their complements:

[27] This notion of presupposition is ultimately too simplistic (Beaver 1997, 2001), but situating our treatment in a more adequate theory of presupposition would have taken us too far afield from the central facts of the paper. It is obvious that such a reformulation is possible.

[28] We thank Pauline Jacobson (p.c.) for discussion of these cases and for the examples in (207).

(208) a. Tina looks/sounds/smells/feels/tastes like/as if/as though Chris has baked sticky buns.

b. Tina ser ut / låter / luktar / känns / smakar som om Chris har bakat kladdkaka.
T. looks out / sounds / smells / feels / tastes as if C. has baked sticky cake
'Tina looks/sounds/smells/feels/tastes as if Chris has baked "sticky cake".'

The difference with respect to copy pronouns is reflected lexically: perceptual resemblance verbs, unlike true copy raising, do not contribute a manager resource (Asudeh 2004); they therefore do not need to consume a pronoun in their complement for successful composition. Asudeh (2004) ties this to the fact that the subject of a perceptual resemblance verb is an argument of the verb, unlike a copy-raised subject. In terms of the semantics we have been developing here, this basically boils down to mode of composition. A perceptual resemblance verb states that its subject is the PSOURCE and composes with its complement without the requirement that the subject compose in place of a copy pronoun.

There is another important difference between copy raising verbs and perceptual resemblance verbs. Namely, the latter restrict the nature of the PSOURCE to an appropriate perceptual dimension as follows:

(209) ***look*:** $visual$ is a partial function, $(D_\varepsilon \cup D_e) \rightharpoonup D_e$, that returns the visual aspect of its argument (i.e., the argument's look).

***sound*:** $aural$ is a partial function, $(D_\varepsilon \cup D_e) \rightharpoonup D_e$, that returns the aural aspect of its argument (i.e., the argument's sound).

***smell*:** $olfactory$ is a partial function, $(D_\varepsilon \cup D_e) \rightharpoonup D_e$, that returns the olfactory aspect of its argument (i.e., the argument's smell).

***feel*:** $tactile$ is a partial function, $(D_\varepsilon \cup D_e) \rightharpoonup D_e$, that returns the tactile aspect of its argument (i.e., the argument's feel) .

***taste*:** $gustatory$ is a partial function, $(D_\varepsilon \cup D_e) \rightharpoonup D_e$, that returns the gustatory aspect of its argument (i.e., the argument's taste).

The interpretation of the verb *sound*, for example, is:

(210) $\lambda x \lambda p \lambda s.sound(s, aural(\textsc{Psource}(s)), p) \wedge \textsc{Psource}(s) =_t x$

The verb *sound* denotes a function on the aural aspect of its PSOURCE (i.e., the PSOURCE's sound) and the verb's complement. This was already anticipated by Rogers (1973: 77), although specific aspects of his proposal are problematic (see footnote 11).

Example (208) with the verb *sound* or *låta* has the following interpretation (setting aside the interpretation of the perception verb's complement):

(211) $\exists s.sound(s, aural(\textsc{Psource}(s)), \ldots) \wedge \textsc{Psource}(s) =_t tina$

Perceptual resemblance verbs in both English and Swedish can also occur with expletive subjects and are therefore ambiguous between a thematic and non-thematic subject reading:

(212) a. It smells/looks/sounds/feels/tastes like Chris has been baking sticky buns.

b. Det ser ut / låter / luktar / känns / smakar som om Chris har bakat kladdkaka.
It looks out / sounds / smells / feels / tastes as if C. has baked sticky cake
'It looks/sounds/smells/feels/tastes as if Chris has baked "sticky cake".'

The interpretation for the case with a thematic subject is the one given in (210) above. In the case with a non-thematic subject, the PSOURCE is existentially closed and the interpretation is as in (213) once again using *sound* as the exemplar. We continue to represent the core verbal function and the existential closure separately, but they could be combined in one meaning term instead.

(213) 1. $\lambda p \lambda s'.sound(s', aural(\textsc{Psource}(s')), p)$

2. $\lambda S \lambda s. \exists v_\varepsilon [S(s) \wedge \textsc{Psource}(s) =_t v_\varepsilon]$

Example (212) with the verb *sound* or *låta* has the following interpretation:

(214) $\exists s \exists v_\varepsilon [sound(s, aural(\textsc{Psource}(s)), \ldots) \wedge \textsc{Psource}(s) =_t v_\varepsilon]$

A perceptual resemblance verb thus consistently denotes a relation between a perceptual aspect of its PSOURCE and the verb's complement, whether the PSOURCE is the verb's subject, as in (210), or is an existentially bound eventuality, as in (213).

The existential closure is once again obligatory in English but only optional in Swedish, since the latter allows a *på*-PP expressing the PSOURCE to occur with expletive-subject perceptual-resemblance verbs:[29]

(215) Det låter på Tina som om Chris har bakat kladdkaka.
It sounds on T. as if C. has baked sticky cake
$\sim$'Tina sounds as if Chris has baked "sticky cake".'

The interpretation of (215) is the same as (211), but this time the PSOURCE is contributed by the *på*-PP rather than the perceptual resemblance verb's subject. In all cases, the verb takes a function on its PSOURCE as an argument, whether the PSOURCE itself is contributed by the verb (from its subject or through existential closure) or is contributed by an adjunct. Thus, a non-expletive subject (*qua* PSOURCE sensory aspect) is an argument of a perceptual resemblance verb (it is represented in the verbal relation). However, even when the subject is an expletive, the perceptual resemblance verb still takes the PSOURCE's sensory aspect as an argument, although the PSOURCE itself is either existentially closed or contributed by a *på*-PP adjunct.

7 Conclusion

We have carried out a comparative study of copy raising in two Germanic languages, English and Swedish. We showed that there were strong similarities between the two languages, but also important differences. In particular, English and Swedish have adjuncts that encode different participants in a perceptual eventuality. English allows expression of the goal of perception (PGOAL) in a *to*-PP and Swedish allows the expression of the source of perception (PSOURCE) in a PP adjunct headed by the preposition *på* ('on'). We argued that PSOURCE and PGOAL are not theta roles in the sense of the Theta Criterion and that the semantics of raising and PSOURCE and PGOAL are problematic for Parsons's theory of thematic relations. We proposed a thematic theory in which thematic roles are tied to semantic arguments, but in which not all semantic arguments necessarily bear a thematic role. In particular, the propositional complement to raising does not bear a thematic role, thus avoiding the problem of unmotivated relations for this complement that

[29] The verbs *lukta* and *smaka* occur less frequently with a *på*-PP than the other perceptual resemblance verbs; in fact, some speakers seem not to like them at all. We think this is the same problem of construal as was discussed in connection with examples (15–16) in section 2. Note that many speakers find such examples unproblematic, and we have found attested examples like the following on the internet:

1. Det luktar på den här discussionen som att det här fallet inte är ett undantag
It smells on this here discussion.DEF like that this here case.DEF not is an exception
'This discussion gives the impression that this case is not an exception.'

arises in Parsons's theory. We also argued for a generalize notion thematic role, which we called a semantic role and proposed that PSOURCE and PGOAL are semantic roles. Copy raising thus motivates finer-grained distinctions between semantic arguments and thematic relations than have hitherto been assumed.

Our formal analysis concentrated on the semantics of copy raising and other instances of the verbs *seem* and *verka*, but we also extended the analysis to related perceptual resemblance verbs (*sound*, *look*, *smell*, *feel*, and *taste*). With respect to the adjuncts, the formal analysis concentrated on the Swedish PSOURCE adjunct, but also extended the analysis to the English PGOAL adjunct. We showed that, in terms of composition, copy raising is related to control, but that in terms of the denotation of the core verbal relation, copy raising is indeed a form a raising, since the copy raising verb's denotation is not evaluated with the subject as an argument. Thus, copy raising has a kind of hybrid meaning term with commonalities to control in its compositional aspect and to raising in its denotational aspect. This in turn reveals a subtler understanding of the general semantics of control and raising.

A puzzle, which we called the *på* puzzle, arose concerning why the Swedish *på*-PP cannot occur in a copy raising sentence. We argued that this is because both the non-expletive copy-raised subject and the *på*-PP are contributing the source of perception, PSOURCE. Although the PSOURCE is not an argument, it must be uniquely specified, on a par with thematic roles. Another puzzle, which we called the puzzle of the absent cook, also concerned PSOURCEs and was likewise explained by the fact that a non-expletive copy-raised subject encodes the source of perception. Our analysis treats as presupposition failure a copy raising sentence uttered in a situation where the source of perception indicated by the subject is absent and the PSOURCE is existentially bound. In contrast, the analysis predicts that a copy raising sentence uttered in a situation where the PSOURCE is an individual, but not the one denoted by the non-expletive copy-raised subject, is false.

The analysis of PSOURCEs bears a potential relationship to other evidentiary phenomena in the semantics literature. For example, Gunlogson (2003) observes that rising declarative questions, as in (216), have stricter felicity conditions than simple interrogatives, as in (217):[30]

(216) It's raining?

(217) Is it raining?

Consider a scenario where the issue of whether it is raining is unresolved, A is in a room that does not allow observation of the weather (e.g., it has no windows) and B enters wearing a raincoat. In such a scenario, both of these utterances are felicitous. However, if B enters without a raincoat on and does not give any other indication that it may be raining, the rising declarative is infelicitous, although the simple interrogative is not. It seems suggestive that the rising declarative entails a source of perception, whereas the simple interrogative does not.

Linguistic encoding of evidentials, as found in languages such as Quechua (Faller 2002) and Tibetan (Garrett 2002), is another potential point of connection with the present work. In terms of Willet's (1988) taxonomy of sources of information, PSOURCEs would seem to belong to the *attested* subcategory of *direct* sources. It would be interesting to see if data from a language with both evidentials and Germanic-type copy raising bore this out, if such a language can be identified. Copy raising is especially relevant to the relationship between evidentiality/perception on the one hand and epistemic modality on the other (Garrett 2002), because it constitutes a case in which the speaker is asserting direct perception of something about which s/he nevertheless remains epistemically uncertain.

The relationship between perception and epistemic knowledge is also particularly salient in English *seem*/*appear* with *that*-complements, as in (218), which we have treated as also requiring a PSOURCE, on a par with expletive alternants of copy raising sentences.

(218) It seems that Tom is cooking.

[30] We thank Line Mikkelsen (p.c.) for bringing these cases to our attention.

If arguments that this sort of *seem/appear* is purely epistemic and does not involve a perceptual report are correct (see Matushansky 2002 and references therein), then the *that*-complement cases lack PSOURCEs (and PGOALs) entirely.

We think a more tenable position is that this use of the verb *seem* also involves both an epistemic and a perceptual aspect. It is otherwise unexplained why a PP expressing a PGOAL (perceiver) can be used with a *that*-complement:

(219) It seemed to her that they did not pose a threat.

Furthermore, Swedish speakers who allow *that*-complements with raising verbs (recall that this is dialectal) allow them to occur with *på*-PPs expressing PSOURCE:

(220) % Det verkar på Tom att han har gjort det.
it seems on T. that he has done it
∼ 'Tom gives the impression that he has done it.'

However, neither English nor Swedish allows a PGOAL or PSOURCE to occur in related examples with the epistemic verb *know*:

(221) a. *Tom knows to me that it is raining.

b. * Tom vet på Robin att det regnar.
T. knows on R. that it rains

The verb *know* is surely as good a candidate for a purely epistemic verb as there is. The fact that PGOAL and PSOURCE adjuncts cannot freely occur with *know* but can occur with *seem* in its *that*-complement guise is therefore a strong indication that even this use of *seem* is not purely epistemic and involves a perceptual component.

A Appendix

1. We have not treated the syntax or semantics of the *like*, *as* or *som* head of the *like/as/som*-complement in any detail. We follow Asudeh (2004) in treating the complement syntactically as an open predicative complement. The semantics of the *like/as/som*-complement is interesting in its own right, but here we simply treat it as a function on its sentential complement; for further details, see Asudeh (2004: ch. 9).

2. The proof rule used in the Glue proofs below is implication elimination, unless explicity indicated otherwise.

3. The lines in bold in the Glue proofs are there for exposition only and are not a formal part of the proof. They specify which lexical item contributes the premise and, where appropriate, the role of the premise.

4. We adopt the standard practice of using English as the meta-language for the Swedish structures below.

A.1 Example: True Copy Raising (English)

(222) John seems like he won.

(223)
$$\begin{bmatrix} \text{PRED} & \text{`seem}\langle\text{XCOMP}\rangle\text{SUBJ'} \\ \text{SUBJ} & j\begin{bmatrix} \text{PRED} & \text{`John'} \\ \text{PERSON} & 3 \\ \text{NUMBER} & \text{SG} \\ \text{GENDER} & \text{MASC} \end{bmatrix} \\ \text{XCOMP} & l\begin{bmatrix} \text{PRED} & \text{`like'} \\ \text{SUBJ} & _____\,j \\ \text{COMP} & w\begin{bmatrix} \text{PRED} & \text{`win}\langle\text{SUBJ}\rangle\text{'} \\ \text{SUBJ} & p\begin{bmatrix} \text{PRED} & \text{`pro'} \\ \text{PERSON} & 3 \\ \text{NUMBER} & \text{SG} \\ \text{GENDER} & \text{MASC} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}_s$$

(224) Interpretation: see Figure 6

A.2 Example: Expletive-Subject Copy Raising (English)

(225) It seems like John won.

(226)
$$\begin{bmatrix} \text{PRED} & \text{`seem}\langle\text{XCOMP}\rangle\text{SUBJ'} \\ \text{SUBJ} & \begin{bmatrix} \text{PRONTYPE} & \text{EXPLETIVE} \\ \text{FORM} & \text{IT} \end{bmatrix} \\ \text{XCOMP} & l\begin{bmatrix} \text{PRED} & \text{`like'} \\ \text{SUBJ} & _____\,j \\ \text{COMP} & w\begin{bmatrix} \text{PRED} & \text{`win}\langle\text{SUBJ}\rangle\text{'} \\ \text{SUBJ} & j\begin{bmatrix}\text{PRED} & \text{`John'}\end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}_s$$

(227) Interpretation: see Figure 7

A.3 Example: *På*-PP (Swedish)

(228) Det verkar på Tom som om John vann.
it seems on T. as if J. won
∼'Tom gives the impression that John won.'

(229)
$$\begin{bmatrix}
\textsc{pred} & \text{`seem}\langle\textsc{xcomp}\rangle\textsc{subj}\text{'} \\
\textsc{subj} & \begin{bmatrix} \textsc{prontype} & \textsc{expletive} \\ \textsc{form} & \textsc{det} \end{bmatrix} \\
\textsc{xcomp} & s\begin{bmatrix}
\textsc{pred} & \text{`like'} \\
\textsc{subj} & \boxed{} \\
\textsc{comp} & l\begin{bmatrix} \textsc{pred} & \text{`win}\langle\textsc{subj}\rangle\text{'} \\ \textsc{subj} & w\begin{bmatrix} \textsc{pred} & \text{`John'} \end{bmatrix} \end{bmatrix}
\end{bmatrix} \\
\textsc{adj} & \left\{ \begin{bmatrix} \textsc{pred} & \text{`on}\langle\textsc{obj}\rangle\text{'} \\ \textsc{obj} & t\begin{bmatrix} \textsc{pred} & \text{`Tom'} \end{bmatrix} \end{bmatrix} \right\}
\end{bmatrix}$$

(230) Interpretation: see Figure 8

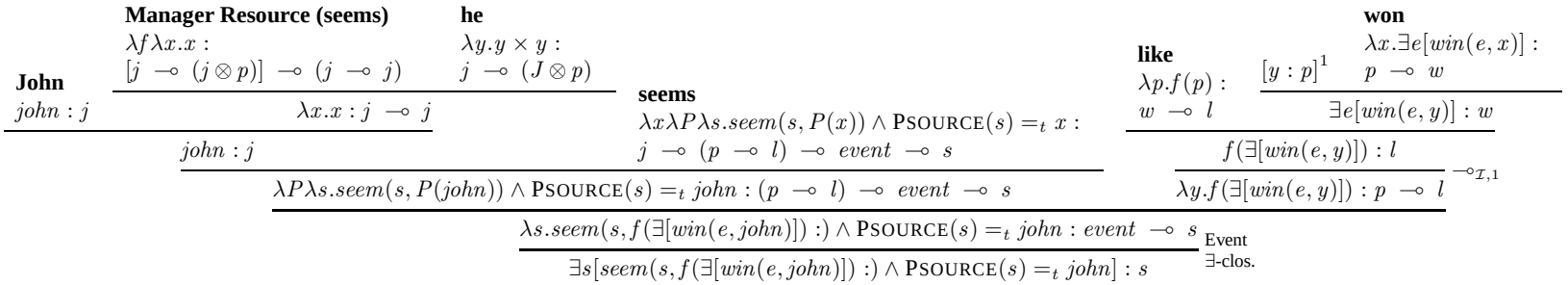


Figure 6: Glue Semantics proof for *John seems like he won*

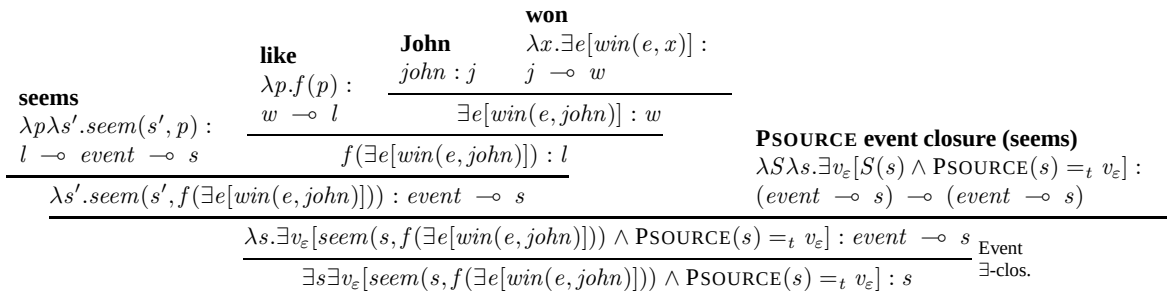


Figure 7: Glue Semantics proof for *It seems like John won*

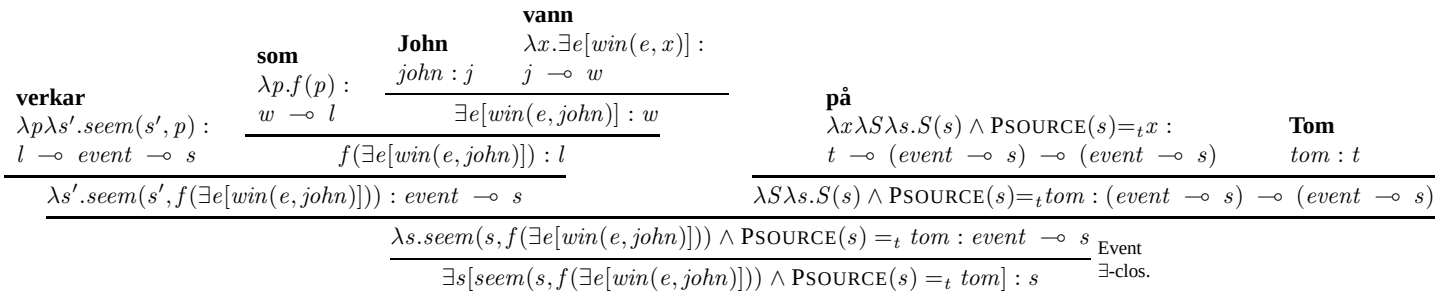


Figure 8: Glue Semantics proof for *Det verkar på Tom som om John vann.* (∼'Tom gives the impression that John won')

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