Toward a Unified Theory of Resumption*

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Contents

1 Introduction

This paper presents a unified theory of resumptive pronouns, based on the Resource Management Theory of Resumption (RMTR; Asudeh 2004, 2009). In particular, it identifies a common basis for puzzlingly different resumptive pronouns in languages such as Irish, which show evidence of 'base-generated' resumptives, versus languages such as Vata, which show evidence of gap-like resumptives.[1]

RMTR is based on the assumption in (1) and the empirical observation in (2).

(1) **Resource Sensitivity Hypothesis (RSH)**:
Natural language is resource-sensitive.

(2) **McCloskey's Generalization**:
Resumptive pronouns are ordinary pronouns.

The Resource Sensitivity Hypothesis is formally captured through the use of the resource logic *linear logic* (Girard 1987) for semantic composition in Glue Semantics (Dalrymple et al. 1993, Dalrymple 1999, 2001). Linear logic is a commutative substructural logic (Restall 2000). Each premise in a valid linear logic proof must be used exactly once.[2] RMTR posits that the key to understanding resumption is the observation that a resumptive pronoun is an obstacle to otherwise successful semantic composition. From the resource-logical perspective, a resumptive pronoun is a surplus resource. Languages that have grammaticized resumptive pronouns license resumptives through the use of *manager resources*, which manage the resource surplus by removing the pronoun.

The second foundation of RMTR is an empirical observation by McCloskey (2002, 2006). In McCloskey's own words:

> A fundamental question, which has not often been explicitly addressed, but which lies behind much of the discussion is why resumptive elements have the form that they do. That is, resumptive pronouns simply *are* (formally) pronouns. I know of no report of a language that uses a morphologically or lexically distinct series of pronouns in the resumptive function. If we take this observation to be revealing, there can be no syntactic feature which distinguishes resumptive pronouns from ordinary pronouns, and any appeal to such a feature must be construed as, at best, an indication of the limits of understanding. (McCloskey 2006: 97; emphasis in original)[3]

Adger (2008) shows that it is important to take care in interpreting McCloskey's generalization. He discusses *bare resumptives* in colloquial Skye Gaelic and São Tomense creole (Adger and Ramchand 2005), which are required to have only default agreement features. However, this does not substantially challenge the generalization, since these forms are normal instances of pronominal inflection. That is, these languages do not use "a morphologically or lexically distinct series of pronouns in the resumptive function". One could not reasonably associate a 'resumptive' feature with the pronominal forms in question. Rather, resumption must be restricted in such a way that only certain otherwise available members of the languages' pronominal paradigms may function resumptively. Adger (2008) provides an analysis of this paradigmatic narrowing in light of the Minimalist Program.

Two direct consequences of McCloskey's generalization are the following:

1. There can be no underlying lexical/morphological/featural distinction specific to only resumptive pronouns in a language *L*. Any pronoun of *L* that occurs resumptively must also occur in other environments.

[1] I use the term 'base-generated' in continuity with the transformational literature, but its use here is meant only pretheoretically, since everything is base-generated in the theory I assume (there are no transformations).

[2] Resource accounting may be turned off for particular premises through the use of linear logic modalities. However, I am assuming a modality-free fragment of the logic; see section 6.

[3] A similar passage can be found in (McCloskey 2002: 192).

2. There can be no process of syntactic insertion or semantic composition that is specific to only resumptive pronouns in a language L. Resumptives of L are inserted and composed just as non-resumptive pronouns of L are.

Both of these consequences follow from McCloskey's generalization by standard morphosyntactic reasoning. If resumptive pronouns are ordinary pronouns, then there cannot be an underlying feature that is specific to resumption. If such a feature existed, we would expect to see a morphological reflex in some language, but no such reflex has been observed; this is consequence 1. The second consequence is a corollary of the first: if there can be no underlying lexical difference between resumptives and non-resumptives, there is no distinction that syntactic insertion and semantic composition can be sensitive to.

We can then distinguish theories according to whether McCloskey's generalization is upheld:[4]

(3) **Ordinary Pronoun Theory (of Resumption)**:
No lexical/morphological/featural/syntactic difference between resumptive pronouns and referential or bound pronouns

(4) **Special Pronoun Theory (of Resumption)**:
Some lexical/morphological/featural/syntactic difference between resumptive pronouns and referential or bound pronouns

Ordinary pronoun theories are straightforwardly compatible with McCloskey's generalization. Special pronoun theories are incompatible with the generalization and it is incumbent upon them to either show that the generalization is not true or else to provide a precise theory as to why resumptives are apparently ordinary pronouns despite being underlyingly special.

The paper is organized as follows. The next section reviews the three kinds of resumption identified by McCloskey (2006). Section 3 presents some relevant data on resumption in Irish and Vata, which exemplify the two kinds of grammaticized resumptive strategies. Section 4 identifies the key challenges for a unified theory of resumption, discusses a potential analysis of Vata-style resumptives in McCloskey (2006), and highlights aspects of the theory to be presented here. Sections 5– 7 are background sections on Lexical-Functional Grammar, Glue Semantics, and Resource Sensitivity. Section 8 presents the Resource Management Theory of Resumption. Section 9 presents analyses of Irish and Vata resumption. Section 10 discusses some theoretical predictions.

2 Three kinds of resumption

In his review of resumption, McCloskey (2006) identifies three types of resumptive pronouns. We can characterize the three types as follows (the terminology is my own):

Kind 1 *Syntactically active resumptives* do not display gap-like properties.
Sample languages: Irish, Hebrew, varieties of Arabic, ...

(5) an ghirseach a-r ghoid na síogaí í (Irish; McCloskey 2002: 189)
the girl COMP-PAST stole the fairies her
'the girl that the fairies stole away'

Kind 2 *Syntactically inactive resumptives* do display gap-like properties.
Sample languages: Vata, Gbadi, Swedish (?)

[4]The theory that I assume is solidly lexicalist, but notice that the the distinction between Ordinary Pronoun and Special Pronoun Theories applies equally to theories that reject the traditional notion of a lexicon, such as Distributed Morphology (Halle and Marantz 1993, Embick and Noyer 2007). For the purposes of cross-theoretical comparison, where I state that a resumptive pronoun is an ordinary pronoun due to its lexical specification, this can equivalently be understood as the claim that a resumptive pronoun accrues the same set of features as an ordinary pronoun.

(6) àlɔ́ ɔ̀ lē sàká là (Vata; Koopman 1982: 128)
who he eat rice *wh*
'Who is eating rice?'

Kind 3 *Processor resumptives* are not grammaticized; they are an artifact of parsing and production. Sample languages: English (cf. 'intrusive pronouns', Sells 1984), Swedish (some apparent resumptives), ...

Processor resumptives can be further classified according to whether they occur as a processing alternative to ungrammatical gaps or as a result of processing complexity (Asudeh 2004). The first kind is labelled 'Kind 3i', where the 'i' is mnemonic for 'island'. The second kind is labelled as 'Kind 3c', where the 'c' is mnemonic for 'complexity'.

Kind 3i Island/ECP resumptives

(7) This is a donkey that I wonder where it lives. (Ferreira and Swets 2005)
(Gap would be ECP-type violation)

(8) I'd like to meet the linguist that Mary couldn't remember if she had seen him before. (Sells 1984: 11)
(Gap would be weak island violation)

(9) I'd like to meet the linguist that Peter knows a psychologist that works with her.
(Gap would be strong island violation)

Kind 3c Complexity resumptives (Erteschik-Shir 1992)

(10) This is the girl that Peter said that John thinks that yesterday his mother had given some cakes to her.

Kind 3 resumptives are not grammatically licensed, since speakers reject them in carefully controlled studies (Alexopoulou and Keller 2002, 2003, 2007, Ferreira and Swets 2005, among others).

In this paper I will be concerned with the two kinds of grammaticized resumptives, which I here call 'syntactically active resumptives' (SARs) and 'syntactically inactive resumptives' (SIRs). The following section presents some data relevant to the distinction.

3 Data

In this section I review some of the data that has been used to support the two distinct kinds of grammaticized resumptive pronouns. I first consider Irish, which has paradigmatic syntactically active resumptives (Kind 1). I then consider Vata, which has paradigmatic syntactically inactive resumptives (Kind 2).

3.1 Irish (Kind 1)

McCloskey (1979, 1990, 2002, 2006) argues that the simplest generalization about resumptive pronouns in Irish is that they occur in any syntactic position in any unbounded dependency, except where blocked by independent constraints. The key independent constraint is the Highest Subject Restriction (McCloskey 1983, Borer 1984, McCloskey 1990, 2002, 2006) which prohibits a resumptive from being the first subject in the body of the unbounded dependency (but allows extraction of embedded subjects):

(11) a. * an fear a raibh sé breoite (McCloskey 1990: 210, (29a))
the man COMP be.PAST he ill
'the man that (he) was ill'

b. * na daoine a rabhadar breoite (McCloskey 1990: 210, (29b))
the people COMP be.PAST.3PL ill
'the people that (they) were ill'

c. cúpla muirear a bhféadfaí a rá go rabhadar bocht
a.few families COMP one.could say.INF COMP be.PAST.3PL poor
'a few families that one could say (they) were poor'
(McCloskey 1990: 210, (30b))

McCloskey (1990) analyzes the Highest Subject Restriction as an $\overline{\text{A}}$-disjointness requirement (essentially an $\overline{\text{A}}$-equivalent of Principle B).

Other than this restriction, Irish resumptives occur in a wide variety of unbounded dependency constructions:

(12) **Restrictive relative clauses**

a. an ghirseach a-r ghoid na síogaí í (McCloskey 2002: 189, (9b))
the girl COMP-PAST stole the fairies her
'the girl that the fairies stole away'

b. an fear a dtabharann tú an tairgead dó (McCloskey 1979: 6, (3))
the man COMP give you the money to.him
'the man to whom you give the money'

(13) **Nonrestrictive relative clauses**

Tháinig an saighdiúir eile, nach bhfaca mé roimhe é, aníos chugainn.
came the soldier other NEG.COMP saw I before him, up to.us
'The other soldier, whom I hadn't seen before, came up to us.'
(McCloskey 1990: 238, (97a))

(14) **Questions**

a. Céacu ceann a bhfuil dúil agat ann? (McCloskey 2002: 189, (10b))
which one COMP is liking at.you in.it
'Which one do you like?'

b. d'inis siad cén turas a raibh siad air
told they what journey COMP be.PAST they on.3SG.MASC
'they told what journey they were on (it)'
(McCloskey 1990: 238, (98a))

(15) **Clefts**

Is tú a bhfuil an deallramh maith ort. (McCloskey 1990: 239, (99a))
COP.PRES you COMP is the appearance good on.2SG
'It is you that looks well.'

(16) **Reduced Clefts**

Teach beag seascair a-r mhair muid ann. (McCloskey 2002: 189, (11b))
house little snug COMP-PAST lived we in.it
'It was a snug little house that we lived in.'

(17) **Comparatives**

Do fuair sé leaba chó math agus a-r lui sé riamh uirthi.
get PAST he bed as good as COMP lie.PAST he ever on.3SG.FEM

'He got a bed as good as he ever lay on (it).'
(McCloskey 1990: 239, (100b))

Irish resumptives are paradigmatic Kind 1 (syntactically active) resumptives: they do not pattern like gaps with respect to two crucial syntactic diagnostics: islands and weak crossover.

Gaps in Irish are island sensitive (McCloskey 1979):

(18) **Complex NP Islands**

a. * an fear aL phóg mé an bhean aL phós (McCloskey 1979: 30, (78))
the man COMP kissed I the woman COMP married
'the man who I kissed the woman who married'

b. * Cén fear aL phóg tú an bhean aL phós? (McCloskey 1979: 30, (80))
which man COMP kissed you the woman COMP married
'Which man did you kiss the woman who married?'

(19) ***Wh*-Islands**

a. * fear nachN bhfuil fhios agam cén cineál mná aL phósfadh
a man COMP.NEG I know what sort of a woman COMP would marry
'a man who I don't know what woman would marry'
(McCloskey 1979: 32, (87))

b. * Cén sagart nachN bhfuil fhios agat caidé aL dúirt?
which priest COMP.NEG you know what COMP said
'Which priest don't you know what said?'
(McCloskey 1979: 32, (88))

c. * Cén sagart aL d'fhiafraigh Seán diot arL bhuail tú?
which priest COMP asked John of you QUEST
'Which priest did John ask you if you hit?'
(McCloskey 1979: 32, (89))

In contrast, Irish resumptives may occur freely in the corresponding islands:

(20) **Complex NP Island**
Sin teanga aN mbeadh meas agam ar duine ar bith aL tá ábalta i a labhairt
that a.language COMP would be respect at me on person any COMP is able it to speak
'That's a language that I would respect anyone who could speak it.'
(McCloskey 1979: 34, (95))

(21) ***Wh*-Island**
Sin fear nachN bhfuil fhios agam cén cineál mná aL phósfadh é
that a man COMP.NEG I know what sort of a woman COMP would marry him
'That's a man who I don't know what kind of woman would marry him.'
(McCloskey 1979: 33, (91))

In sum, gaps in Irish are island-sensitive, but resumptives are not.

Gaps in Irish are subject to weak crossover effects:

(22) a. * fear a d'fhág a bhean _ (McCloskey 1990: 237, (95a–b))
man COMP left his wife
'a man that his wife left'

b. * an fear so a mhairbh a bhean féin _
this man COMP killed his own wife
'this man that his own wife killed'

In contrast, resumptive pronouns in Irish are not subject to weak crossover effects:

(23) a. fear ar fhág a bhean é (McCloskey 1990: 236–7, (94a–b))
man COMP left his wife him
'a man that his wife left'

b. an fear so ar mhairbh a bhean féin é
this man COMP killed his own wife him
'this man that his own wife killed'

In sum, gaps in Irish are subject to weak crossover effects, but resumptives are not.

The distinctions in island-sensitivity and weak crossover between gaps and resumptives are expected if resumptives are not gaps underlyingly and resumptive unbounded dependencies are formed by another syntactic mechanism, such as anaphoric binding of a base-generated pronoun.

3.2 Vata (Kind 2)

Vata requires the foot of a unbounded dependency to be a resumptive pronoun if it is a subject and a gap otherwise (Koopman 1982, Koopman and Sportiche 1982), as exemplified in the following *wh*-questions:

(24) a. **Highest subject**
àlɔ́ ɔ̀ / * __ lē sȧká lȧ (Koopman 1982: 128, (1a))
who heR / * __ eat rice WH
'Who is eating rice?'

b. **Embedded subject**
àlɔ́ ǹ gūgū nā ɔ̀ / * __ yì lȧ (Koopman 1982: 128, (4a))
who you think that heR / * __ arrive WH
'Who do you think arrived?'

c. **Highest object**
yī kòfi lẻ __ / * mí lȧ (Koopman 1982: 128, (1b))
what Kofi eat __ / * it WH
'What is Kofi eating?'

d. **Embedded object**
àlɔ́ ǹ gūgū nā wȧ yɛ̀` __ / * mɔ̀ yé lȧ (Koopman 1982: 128, (4b))
who you think that they see __ / him PART WH
'Who do you think they saw?'

Example (24a) also illustrates that the Highest Subject Restriction does not seem to hold in Vata. I am not aware of any deep explanation of this cross-linguistic variation between Vata on the on hand and Irish and several other languages on the other (see Asudeh 2004: 115–121); I will not seek to develop one here.

In contrast to the situation in Irish, Vata resumptive pronouns behave like gaps with respect to weak crossover (Koopman and Sportiche 1982) and islands (Koopman and Sportiche 1986). A resumptive pronoun creates a weak crossover violation:

(25) * àlɔ́$_i$ ɔ̇$_i$ nɔ́ gùgù nā ɔ̀$_i$ mlì lȧ (Koopman and Sportiche 1982: 10a)
who$_i$ his$_i$ mother think that he$_i$ left WH
'Who did his mother think left?'

(26) * àlɔ́$_i$ ǹ yrȧ ɔ̇$_i$ nɔ́ nā ɔ̀$_i$ mlì lȧ (Koopman and Sportiche 1982: 10b)
who$_i$ you tell his$_i$ mother that he$_i$ left WH
'Who did you tell his mother left?'

Similarly, subject resumptive pronouns may not be extracted from *wh*-islands, which is again surprising for an overt element:

(27) * àlÓ ǹ nÌ̍ [zĒ mĒmĖ̀ gbÙ̍ Ò dÌ̍̀ -ɓÒ̍ *t* mÉ] yì lá̍
who you NEG-A reason it-it for he-R cut REL it know WH
'Who don't you know why he cut it?'
(Koopman and Sportiche 1986: 161, (19a))

(28) * àlÓ ǹ nylá̍ nynı̍ nā Ò dÌ̍ mÉ lá̍ (Koopman and Sportiche 1986: 161, (19b))
who you wonder NA he-R cut it WH
'Who do you wonder whether he cut it?'

Vata resumptives, despite being overt elements, cannot occur in islands and give rise to weak crossover effects. Whatever one's theory of islands and weak crossover, Irish resumptives and gaps are distinguished by these diagnostics, but Vata resumptives and gaps are not.

Vata also poses an apparent challenge to McCloskey's generalization, because Vata pronouns have distinct tone in their resumptive function. Resumptive pronouns have low tone (ɔ̀, ì, . . .) instead of mid-high tone (ɔ̍, ı̍, . . .) (Koopman and Sportiche 1982):

(29) àlɔ́ ɔ̀ mlì lá̍ (Koopman and Sportiche 1982: 14a)
who heR left WH
'Who left?'

(30) ɔ̍ mlì (Koopman and Sportiche 1982: 14b)
he left
'He left.'

Vata resumptives thus seem to constitute a case of special morphosyntactic marking of a pronoun in its resumptive function. This morphosyntactic marking and the gap-like nature of Vata resumptives initially seem to lend credence to the claim that Vata resumptives are special pronouns, somehow lexically like gaps and unlike other pronouns.

However, the low tone marking does not in fact signal resumption per se, but rather signals that the pronoun is bound by a *wh*-operator. Koopman and Sportiche (1982: 24) write:

> [A] low tone pronoun may also occur in a position which is, informally speaking, neither too close, nor too far from the site of a *wh*-element provided that it is coindexed with a *wh*-trace, or a low tone pronoun [+*wh*].

This is illustrated by the following example:

(31) àlɔ́$_i$ ɔ̀ gūgū nā ɔ̍$_j$ / * ɔ̍$_i$ / ɔ̀$_i$ ní yà lá̍
who$_i$ heR$_i$ think that he-ɔ̍$_j$ / * he-ɔ̍$_i$ / he-ɔ̀$_i$ NEG healthy WH
'Who thinks he is sick?'
(Koopman and Sportiche 1982: (15a))

The upper occurrence of ɔ̀ ('he') with low tone is the obligatory subject resumptive. The lower occurrence of of ɔ̀ is not a resumptive, but rather a pronoun bound by the same *wh*-phrase. A mid-high tone ɔ̍ in this position is ungrammatical on the *wh*-bound reading. A pronoun with this tonal marking can only be understood as disjoint from the *wh*-phrase.

Instances of low tone pronouns as in (31) do not cause weak crossover violations:

(32) àlɔ́$_i$ ɔ̀$_i$ yrá̍ ɔ̍$_i$ nɔ́ nā ɔ̀$_i$ mlì lá̍ (Koopman and Sportiche 1982: (16))
who$_i$ heR tell his$_i$ mother that he$_i$ left WH
'Who told his mother that he left?'

Here the low tone pronoun in the embedded clause may be bound by the pronoun ɔ̀ ('his') without a weak crossover violation; contrast (32) with (26). The lack of a weak crossover effect in (32) is not surprising, because it is the matrix subject that is extracted. The matrix subject is not in a weak crossover configuration with ɔ̀, since the subject is not commanded by the pronoun. The embedded low tone pronoun in (32) is not the base of an unbounded dependency, so it should not give rise to weak crossover. In sum, the low tone marking cannot be interpreted as diagnostic of a resumptive pronoun *qua* spelled out variable. The low tone is actually a marking on subjects that is a reflex of being bound by a *wh*-operator. Thus, despite initial appearances, Vata does not constitute an exception to McCloskey's generalization.

4 Challenges for a unified theory

Table 1 classifies the two kinds of grammaticized resumptives according to some syntactic characteristics that are generally thought to be at least roughly diagnostic of gaps, although it is not the case that every sort of gap in every language displays the full set of properties. The table reveals that Kind 1 resumptives (SARs) do not display gap-like properties, whereas Kind 2 resumptives (SIRs) do. By 'gap-like property' I just mean a property that is generally associated with the base of an unbounded dependency that is not overtly realized; no commitment to traces or copies is intended. The correlation with gaps is ultimately the motivation for the terms 'syntactically active' and 'syntactically inactive': in the analysis below, I will treat SARs as present in both the syntax and semantics and SIRs as absent – hence gap-like and inactive — in (part of) the syntax, but nevertheless present in the semantics.

	Syntactically Active RPs	Syntactically Inactive RPs
Grammatically Licensed	Yes	Yes
Island-Sensitive	No	Yes
Weak Crossover Violation	No	Yes
Reconstruction Licensed	No (?)	Yes
ATB Extraction Licensed	No (?)	Yes
Parasitic Gap Licensed	?	Yes

Table 1: Some diagnostic properties of SARs and SIRs

Island-sensitivity and weak crossover are cross-theoretically regarded as diagnostics of filler-gap dependencies and are therefore quite strong diagnostics for whether an item is gap-like. This is why particular attention was paid to these diagnostics in the previous section.

The final three properties in Table 1 — licensing of reconstruction, across-the-board extraction, and parasitic gaps — are somewhat weaker diagnostics, since whether they require a gap is partly theory-dependent. Reconstruction is still somewhat poorly understood and may be licensed semantically (Sharvit 1999, Sternefeld 2001), instead of or in addition to being licensed syntactically. In this case, we might again expect certain appropriately anaphoric elements to display reconstruction effects (Guilliot and Malkawi 2006, 2008, Guilliot 2008). Furthermore, recent work has begun to show that reconstruction is not a uniform phenomenon with respect to resumption (Rouveret 2002, 2008, Bianchi 2008, Guilliot and Malkawi 2008) .

ATB extraction is often considered to be a strong diagnostic of gaps, but the relevant generalizations may in fact involve discourse coherence, given certain systematic exceptions (see Kehler 2002 for an overview and an analysis based on coherence). If discourse coherence plays an important role in exceptions to ATB, then ATB may not clearly distinguish between pronouns and gaps. Asudeh and Crouch (2002) present an integration of Kehler's theory with Glue Semantics, such that ATB extraction concerns configurations in Glue proofs, which are objects of the syntax–semantics interface.[5] Given the theory of resumption I am assuming, since pronouns are removed in semantic composition in these very proofs, a resumptive pronoun may license ATB extraction, all else being equal (Asudeh 2004: 269–276). There is presently not a lot of data on ATB extraction in the resumption literature (a little data on Swedish can be found in Zaenen et al. 1981), so the empirical facts also need further investigation.

Parasitic gaps may also be licensed at the syntax–semantics interface in such a way that certain anaphoric elements might be expected to participate (Asudeh 2004: 269–276). Indeed, whether SARs license parasitic gaps has been contentious in the literature on Hebrew. Borer (1984) and Sells (1984) have claimed that Hebrew resumptives do license parasitic gaps, while Shlonsky (1992) has claimed that they do not. However, Hebrew resumptives do not otherwise display gap-like properties, patterning much like Irish resumptives (Sells 1984), hence the question mark in the relevant cell.

These differences between SARs and SIRs — particularly the island and weak crossover data — highlight the challenge for a unified theory of resumption. On the one hand, SARs do not seem to display the properties of filler-gap dependencies. On the other hand, SIRs do seem to display the properties of filler-gap dependencies. The issues are lucidly laid out by McCloskey (2006) with respect to the notion of A-bar movement in Principles and Parameters Theory (P&P; Chomsky 1981, 1995):

> There is a sense, though, in which these results do not challenge what I have called here the consensus view in any very deep way. The two sets of properties (properties of movement-derived constructions and properties of non-movement-derived constructions) still line up in neat opposition. In Swedish, Vata, and Gbadi, those A-bar-binding relations which terminate in a pronoun show the complete constellation of properties associated with A-bar-movement. In Irish and similar languages, resumptive pronoun constructions show none of those properties. *As long as we can make sense of the idea that a pronoun can be the 'spell-out' of a trace (as in the former group of languages), the larger conceptual architecture is not severely threatened.*
>
> Two points are worth making, however. The first point is that, *interpreted in this way, the observations imply that the phenomenon of resumption is not theoretically uniform.* The second is that in the theoretical context in which such proposals were first made, it was not clear that the notion 'spell-out of a trace' made much sense. Two strands of development, however, changed that. One has to do with our understanding of the movement operation, and the other has to do with our understanding of the category 'pronoun'. (McCloskey 2006: 109; emphasis added)

This passage aptly summarizes the tension between SARs and SIRs, but I take issue with the two italicized passages. First, the notion of a spell-out of a trace is still problematic. Second, there is more uniformity between the two kinds of grammaticized resumptives than is first apparent, providing we take the right perspective. The latter is the main theoretical point of this paper and will be framed in a theoretical framework quite distinct from P&P, but I think the key intuitions could be adapted.

McCloskey (2006: 109–110) sketches one way to understand 'spell-out of a trace', in terms of the Minimalist Program (MP; Chomsky 1995). The movement operation in Minimalism, Move, is often understood to be comprised of two sub-operations, Copy and Delete. A trace is, on this view, really a deleted copy, where deletion is a post-spell-out operation at the interface level of Phonetic Form. McCloskey (2006: 110) suggests that SIRs are the result of partial (rather than complete) deletion of a phrase. He suggests that, given the common theoretical position that pronouns are determiners (Postal 1966, Abney 1987, Koopman 1999, Elbourne 2005), a Kind 2 syntactically inactive resumptive pronoun results from deleting the NP-part of a moved phrase, stranding a D. The stranded D is realized

[5] Steedman (2007) argues against Asudeh and Crouch's analysis, arguing that the relevant cases instead involve a lexical ambiguity for *and*.

as the resumptive pronoun. (A similar suggestion is made by Boeckx (2003), but in terms of moving only the NP part, rather than deleting only the NP part, which is an important theoretical distinction in MP.)

McCloskey (2006: 110) provides the sample derivation (34) for the Swedish example (33):

(33) Vilket ord visste ingen hur det stavas _? (Engdahl 1985: 8, (11))
which word knew no one how it is.spelled _
'Which word did nobody know how it is spelled?'

(34) a. $[_{IP}$ they are not sure $[_{CP}$ how $[_{IP}$ $[_{DP}$ *which* $[_{NP}$ *word*]] is spelled]]]

b. $[_{CP}$ $[_{DP}$ which $[_{NP}$ word]] $[_{IP}$ they are not sure $[_{CP}$ how $[_{IP}$ $[_{DP}$ *which* $[_{NP}$ *word*]] is spelled]]]]

c. $[_{CP}$ $[_{DP}$ which word] $[_{IP}$ they are not sure $[_{CP}$ how $[_{IP}$ $[_{DP}$ *which* $[_{NP}$ $\emptyset$]] is spelled]]]]

d. $[_{CP}$ $[_{DP}$ which word] $[_{IP}$ they are not sure $[_{CP}$ how $[_{IP}$ $[_{DP}$ *it* $[_{NP}$ $\emptyset$]] is spelled]]]]

There are a number of problems with this proposal, some of which are anticipated by McCloskey himself.

First, the claim that pronouns are determiners is not equivalent to the claim that determiners are pronouns. Pronouns are a subset of the determiners, if we accept the relevant arguments, which means there is no reason to expect all stranded determiners to be realized as pronouns. In (34), something curious happens between steps (c) and (d): *which* becomes *it*. McCloskey (2006: 110) acknowledges that this is an open problem when he writes, "Why exactly is it that the results of partial deletion systematically resemble pronouns?" There is presently no understanding as to why why this should be so. Second, given normal Minimalist assumptions, there should be a triggering feature for the partial deletion, but no appropriate feature has ever been proposed, as far as I am aware. McCloskey (2006: 110) also anticipates this objection, when he writes, "What mechanism forces or permits partial deletion following movement?"

As these brief quotes from McCloskey (2006) make clear, the two problems just noted can be recast as exciting research avenues in Minimalist theory. However, there is a third, more intractable problem with the entire 'spell-out of a trace' line of reasoning, even if the notion is realized in Minimalist terms. Namely, the partially deleted copy and ordinary pronouns are lexically distinct. This is easily observed if we think about the featural make-up of the items involved in (34). The Kind 2 resumptive *it* is a realization of a *wh*-determiner, *which*. The *wh*-determiner must have a WH feature. An ordinary version of *it* must not have a WH feature. The question becomes: Why should the partially deleted D be realized with the same form as a base-generated pronoun, given that the deleted D and a base-generated pronoun have distinct features? In other words, any attempt to derive Kind 2 resumptive from an underlying copy will by definition have to treat Kind 2 resumptives as special pronouns. This in turn leads to a serious empirical problem: there is no known case of even Kind 2 resumptives being realized distinctly from ordinary pronouns. That is, McCloskey's generalization holds equally of Kind 2 resumptives.

This brings us to the lack of theoretical uniformity that is mentioned in the other highlighted passage above. The 'spell-out of trace' notion of Kind 2 resumptives inevitably leads to understanding them as special pronouns, whereas, if McCloskey's generalization is to be upheld, we want to understand both Kind 1 and Kind 2 resumptives as ordinary pronouns. Quite apart from this, if Kind 1 resumptives are understood as base-generated and Kind 2 resumptives are understood as remnants of movement (in some sense), then quite different mechanisms are at play in the two kinds of resumption. In the analysis below, I agree with McCloskey that there must be distinct mechanisms at play in how Kind 1 and Kind 2 resumptives are related to their antecedents, but it would be a step forward if we could find at least some unifying aspects of the two kinds of grammaticized resumption, even if they must be syntactically distinct.

In the remainder of this paper, I want to show that we can find a uniform basis for both kinds of resumption, such that the grammatical operations involved in Kind 1 resumption are a proper subset of those involved in Kind 2 resumption. That is, Kind 2 resumption involves Kind 1 resumption and something more. The 'something more' is a syntactic operation. It is what makes Kind 2 resumptives syntactically inactive. Since the operation is absent in the case of Kind 1 resumptives, they remain syntactically active.

The main questions are the following, with anticipatory answers provided:

1. Is there a unifying aspect to Kind 1 resumptives (SARs) and Kind 2 resumptives (SIRs)?

   Yes, semantic composition

2. Can SIRs and their 'movement'-like properties be reconciled with McCloskey's generalization?

   Yes, by recognizing that it is the regular filler-gap relation that needs to be adjusted to account for these resumptives, rather than the pronoun itself.

3. Can the interpretation of SIRs be reconciled with their curiously gap-like syntax?

   Yes, by treating these resumptives lexically as identical to other pronouns.

In particular, SIRs and SARs alike will be analyzed as lexically identical to ordinary pronouns.

The key intuitions behind the analysis are as follows:

1. Resumption, in languages that have the lexical resources to license it, is just another role that pronouns play in the grammar, like referring and serving as bound variables.

2. Resumptive pronouns are *always* regular pronouns licensed at the syntax–semantics interface.

3. Therefore, they always have the same possibilities of interpretation as regular pronouns and they always have the same morphological form as regular pronouns.

4. However, the *relation* between the binder of the resumptive and the pronoun is modified in the case of SIRs.

This results in the simplest possible explanation of resumption: Resumptive pronouns look like and are interpreted like ordinary pronouns because there is nothing special about resumptive pronouns *qua* pronouns. Resumptive pronouns are always underlyingly pronouns.

5 Lexical-Functional Grammar

This section presents the independently motivated parts of LFG theory that will be used in the subsequent analyses. Those familiar with the theory may wish to skip certain sections, but section 5.5 is particularly important. Section 5.1 presents the general theoretical architecture; this is useful for general understanding, but also for understanding how Vata pronominal tone-marking is handled in section 9.2. Section 5.2 presents background on f-structure, LFG's representation of abstract syntactic relations. Section 5.3 discusses the theory's representation of pronominal information. Section 5.4 presents the theory of unbounded dependencies. Section 5.5 presents the restriction operator on f-structures (Kaplan and Wedekind 1993), which will be crucial in the analysis of Vata. Section 5.6 presents templates for generalizing over structural descriptions (Dalrymple et al. 2004), which will be useful in capturing certain lexical generalizations in the subsequent analyses.

5.1 The Correspondence Architecture

The grammatical architecture of LFG posits that different kinds of linguistic information are modelled by distinct data structures, all of which are present simultaneously. Structures are related by functions, called correspondence or projection functions, which map elements of one structure to elements of another. This architecture is a generalization of the architecture of Kaplan and Bresnan (1982) and is called the *Parallel Projection Architecture* or *Correspondence Architecture* (Kaplan 1987, 1989, Halvorsen and Kaplan 1988, Asudeh 2006, Asudeh and Toivonen 2008); I will use the latter term.

The original LFG architecture is shown in (35).

(35) **The original LFG architecture** (Kaplan and Bresnan 1982)

$$\text{c(onstituent)-structure} \xrightarrow{\phi} \text{f(unctional)-structure}$$

This architecture presented the two syntactic structures, c-structure and f-structure, that form the heart of LFG theory. C(onstituent)-structures are represented as phrase structure trees and model word order, dominance, constituency and syntactic categories; c-structure thus represents surface syntax. F(unctional)-structures are represented as feature structures (also known as attribute value matrices). An f-structure is a finite set of attribute–value pairs, such that an attribute is a symbol and its value is: a) a symbol (e.g., SINGULAR or +); b) a semantic form (a potentially complex symbol in single quotes); c) a set; or d) an f-structure. F-structures represent grammatical functions, such as SUBJECT and OBJECT, and also represent a range of morphosyntactic information, such as case, agreement features, tense and aspect. F-structure is the level at which abstract syntactic relations are captured, such as agreement, control and raising, binding, and unbounded dependencies.

The correspondence function ϕ maps c-structure nodes to f-structures. The mapping is many-to-one and is determined by language-specific instantiations of general mapping principles (Bresnan 2001, Toivonen 2003) on annotated phrase structure rules. Lexical information is mapped from terminal nodes in c-structure, which contain all of the information lexically associated with the word. The annotations on c-structure nodes — including lexical annotations on terminals — are equations that specify attributes and values in f-structure or else constrain the attributes and values. The mapping is stated in terms of two metavariables over f-structure labels, as defined in (36).

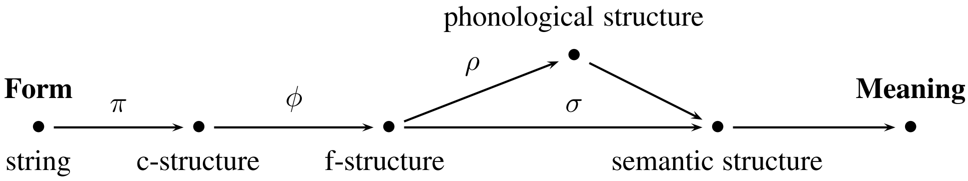
(36) a. $\downarrow :=$ 'the f-structure of this c-structure node' (i.e., 'my f-structure')

b. $\uparrow :=$ 'the f-structure of the node that immediately dominates this c-structure node' (i.e., 'my mother's f-structure')

The up and down arrows are meant to symbolize their meaning graphically: since the annotations on non-terminals are typically written above the category label in c-structure, the up arrow is pointing at the mother and the down arrow is pointing at the current node. For example, an annotation ($\uparrow$ SUBJ) $= \downarrow$ on a node n states that the f-structure of n is the value of the SUBJ grammatical function in the f-structure of n's c-structure mother.

The initial architecture was subsequently generalized to a full Correspondence Architecture, which postulates other grammatical structures. Linguistic generalizations are factored into separately constrained levels with explicit correspondences between the levels. The levels and the correspondences constitute the form–meaning mapping. Kaplan (1987, 1989) suggests a programmatic version of the architecture, much of which has been adopted in the subsequent literature, although sometimes in an altered form. Asudeh (2006) draws these subsequent developments together and presents an updated version of the Correspondence Architecture. Here I will assume the architecture in (37), which is a proper subpart, or detail, of the architecture in Asudeh (2006).

(37) **Detail of LFG's Correspondence Architecture** (adapted from Asudeh 2006)



There are two principle methods for capturing the relations between structures:

1. Description by analysis

2. Codescription

In description by analysis (Halvorsen 1983), one structure is analyzed to yield another structure. This is akin to the kind of interpretive semantics one finds in LF-based approaches (e.g., Heim and Kratzer 1998), in which a logical form is interpreted in toto to yield the semantics (although compositionally).

In codescription, which is now the prevailing approach in LFG, a single description simultaneously describes various structures (Fenstad et al. 1987, Halvorsen and Kaplan 1988). For example, in a single lexical entry, there may be specifications about f-structure, phonological information, and meaning terms for semantics, as well as the basic c-structural category of the lexical item. This is more akin to syntax and semantics in Categorial Grammar, in which each lexical item specifies its syntactic combinatorics, semantic combinatorics, and prosodic combinatorics. The analysis of SIRs that I present below relies on codescription and thus, to the extent that it is right, constitutes an argument for codescriptional approaches to grammar.

5.2 F-structure: Structural descriptions and general well-formedness conditions

LFG strongly distinguishes between the formal objects of the theory (e.g., trees and feature structures) and structural descriptions of the objects. Structural descriptions are sets of formal statements that must be satisfied by the structure in question.

F-structures are described using a small inventory of relations and constraints. The most commonly used relation is equality, as found in *defining equations*, such as (38), and *constraining equations*, such as (39).

(38) $(\uparrow \text{CASE}) = \text{ACCUSATIVE}$ *defining equation*

(39) $(\uparrow \text{CASE}) =_c \text{ACCUSATIVE}$ *constraining equation*

The intuitive distinction between the two kinds of equation is that defining equations add information to an f-structure (if the result is Consistent; see (46) below), whereas constraining equations check whether the relevant information exists. A constraining equation can only be satisfied if the information has been added by another source.

Three other major kinds of constraints are *negative equations*, *existential constraints* and *negative existential constraints*:

(40) $(\uparrow \text{CASE}) \neq \text{ACCUSATIVE}$ *negative equation*

(41) $(\uparrow \text{CASE})$ *existential constraint*

(42) $\neg(\uparrow \text{CASE})$ *negative existential constraint*

A negative equation is satisfied if and only if the feature has a value other than the one specified (or the feature is absent entirely). The negative equation (40) is satisfied iff ↑ has no CASE feature or if the value of CASE is something other than ACCUSATIVE. An existential constraint is satisfied iff the attribute in question is present (regardless of its value). The existential constraint (41) requires ↑ to have a CASE feature. A negative existential constraint is satisfied iff the attribute in question is absent (regardless of its value). The negative existential constraint (42) requires ↑ not to have a CASE feature.

Grammatical functions are an important part of the information captured at f-structure. The *governable grammatical functions* are listed in (43).

(43) **Governable grammatical functions**:
SUBJ(ECT), OBJ(ECT), OBJ(ECT)$_\theta$, OBL(IQUE)$_\theta$, COMP(LEMENT), XCOMP

OBJ$_\theta$ is a thematically-restricted secondary object, such as the second object in a ditransitive (*John gave Bill a book*), which in English is restricted to being a Theme. OBL$_\theta$ is a complement that has oblique case or is a PP (*John gave a book to Bill*). COMP is a closed sentential complement that has its own subject, as in finite sentential complements in English (*John said that Bill left*). XCOMP is an open complement whose subject must be specified externally, as in complements to raising verbs (*John seems to be happy*) and predicative complements more generally (*Bill considers John happy*).

Predicates subcategorize for governable grammatical functions in PRED features:

(44) PRED 'devour⟨SUBJ,OBJ⟩'

(45) PRED 'seem⟨XCOMP⟩SUBJ'

The value of a PRED attribute is a *semantic form*, which is notationally indicated by the single quotes. Semantic forms are special, complex symbols that are always uniquely instantiated. This is captured formally through indexation, e.g. 'devour$_{12}$⟨SUBJ,OBJ⟩', but the indices are typically suppressed. The first part of the PRED's value is the predicate function, which is conventionally the stem form of the lexical item that contributes the PRED. The PRED feature specifies how many and which governable grammatical functions the verb selects, as indicated in its argument list, which immediately follows the predicate function. Thematic and non-thematic arguments are notationally distinguished, since they are subject to different constraints. Thematic arguments are written within the angled brackets, whereas non-thematic arguments are written following the angled brackets. It is important to realize, though, that PRED is not a semantic representation, but rather the syntactic interface to certain semantic information.

F-structures are subject to the following general principles, following the formulation of Asudeh and Toivonen (2008):

(46) **Consistency**
Every f-structure is such that every attribute has exactly one value.

(47) **Completeness**
An f-structure is *complete* if and only if it contains all the governable grammatical functions that its predicate governs.

(48) **Coherence**
An f-structure is *coherent* if and only if all the governable grammatical functions it contains are governed by a predicate.

Consistency (a.k.a. Uniqueness) entails that f-structures are total functions from attributes to values. Notice that consistency does not preclude different attributes from having the same value; f-structures are thus many-to-one functions. The term 'governed by a predicate' in (47) and (48) just means to be listed in the arguments of a PRED feature. Completeness and Coherence serve a similar role in LFG as the Projection Principle, the Theta Criterion and Full Interpretation do in P&P and that the Subcategorization or Valence Principle does in Head-Driven Phrase Structure Grammar (HPSG; Pollard and Sag 1994). They ensure that the subcategorization requirements of a predicate are met exactly.

5.3 Pronominal information

Pronominal lexical entries generally contain the following sort of information:

(49) *she*, D (↑ PRED) = 'pro'
(↑ PERSON) = 3
(↑ NUMBER) = SG
(↑ GENDER) = FEM
(↑ CASE) = NOM

Pronouns lexically specify information about their PRED, agreement features (PERSON, NUMBER, GENDER) and case (where appropriate). The case and agreement features are represented fairly simply here, but more sophisticated analyses take into account resolution of pronominal information in more complex instances (Dalrymple and Kaplan 2000), such as coordination.

Pronominal information can also be incorporated morphologically into heads, as in the inflected Irish verbs and prepositions in section 3.1. One of the examples is repeated here with a corresponding lexical item for the inflected preposition:

(50) an fear a dtabharann tú an tairgead <u>dó</u> (McCloskey 1979: 6, (3))
the man COMP give you the money to.him
'the man to whom you give the money'

(51) *dó*, P (↑ PRED) = 'to⟨OBJ⟩'
(↑ OBJ PRED) = 'pro'
(↑ OBJ PERSON) = 3
(↑ OBJ NUMBER) = SG
(↑ OBJ GENDER) = MASC
(↑ OBJ CASE) = ACC

The preposition specifies pronominal information about its OBJ, the morphologically incorporated pronominal. The f-structure of the preposition will thus contain an OBJ f-structure that is indistinguishable from the f-structure that a morphologically independent object pronoun would have contributed.

Morphologically independent and incorporated pronominals alike provide a PRED feature with value PRO. This value is common to not just personal pronouns, but to all pronouns, including *wh*-pronouns. The 'pro' value is a semantic form and all instances are therefore unique. Two instances of PRO cannot be unified; therefore, two pronominal f-structures with PRED 'pro' cannot be equated, even if their other features agree. This is an important part of Andrews's (1990) LFG analysis of analytic and synthetic verb forms in Irish, where the latter contain incorporated pronominal information and cannot occur with an otherwise appropriate overt pronoun (McCloskey and Hale 1984).

5.4 Unbounded dependencies

There are versions of LFG that postulate traces/empty categories at the base of (at least some) unbounded dependencies (Bresnan 1995, 2001) and versions which eliminate traces entirely (Kaplan and Zaenen 1989, Dalrymple 2001). All else being equal, elimination of traces is clearly more parsimonious, so I assume the latter, traceless variant.

An unbounded dependency in this approach involves equations of one of the following two general forms:

(52) $(\uparrow \textbf{Top}) = (\uparrow \quad \textbf{Body} \quad \textbf{Base})$

(53) $(\uparrow \textbf{Top})_\sigma = ((\uparrow \textbf{Base})_\sigma \ \textsc{antecedent})$

The top of the unbounded dependency is an unbounded dependency function, traditionally TOPIC or FOCUS (King 1995).

I will here break from this traditional use of TOPIC and FOCUS, and instead assume a single function, which I will call UNBOUNDED DEPENDENCY FUNCTION, or UDF for short. There is solid theoretical motivation for this. As in much of the linguistic literature, there is a kind of ambiguity in previous LFG literature between TOPIC and FOCUS as syntactic entities (King 1995, Bresnan 2001: 97) and as information structure or discourse entities (King and Zaenen 2004). The Correspondence Architecture can avoid this ambiguity by positing only a single function, UDF, in f-structure where this function can be mapped contextually to either i(nformation)-structure TOPIC or FOCUS, through the use of the ι correspondence function. This simplifies many syntactic generalizations that are neutral as to the information-theoretic status of the top of the unbounded dependency, but allows TOPIC/FOCUS distinctions to be drawn where necessary.[6]

A UDF function must be properly integrated into the f-structure, in accordance with the Extended Coherence Condition (Zaenen 1980, Bresnan and Mchombo 1987, Asudeh and Toivonen 2008), which states that a UDF must either be functionally equal to or anaphorically bind another grammatical function. Functional equality involves equations of the form (52). Anaphoric binding involves equations of the form (53). The latter equation involves the σ projection to sem(antic)-structure, since it is assumed that the ANTECEDENT feature for anaphoric binding is represented at sem-structure (Dalrymple 1993).

It has generally been assumed that the first case applies to filler-gap dependencies (Kaplan and Zaenen 1989) and that the second case applies to binder-resumptive dependencies (Asudeh 2004) and various other cases involving anaphoric links between the top and base of the unbounded dependency, such as hanging topics. I want to argue here that the crucial difference between syntactically active resumptives and syntactically inactive resumptives is whether the relation between the binder and the resumptive is anaphoric binding — appropriate for SARs — or functional equality — appropriate for SIRs. I thus follow McCloskey's general suggestion that the two different kinds of grammaticized resumptives form different sorts of relations with their binders, but recast it in LFG-theoretic terms. This will allow the crux of the two kinds of resumption to be uniform and will allow McCloskey's generalization to be upheld.

The unbounded nature of a syntactically active binder-resumptive dependency is captured by the general unbounded nature of anaphoric binding.[7] The unbounded nature of filler-gap dependencies and syntactically inactive binder-resumptive dependencies is captured through *functional uncertainty* (Kaplan and Zaenen 1989), which simply depends on the definition of the f-structure description language as a regular language. F-structure equations and constraints are therefore stated in terms of regular expressions, which support optionality, disjunction, negation, complementation, and arbitrary repetition (using the Kleene operators (Kleene 1956): Kleene star (*), which means 'zero or more occurrences of the annotated expression', and Kleene plus ($^+$), which means 'one or more occurrences of the annotated expression'). Functional uncertainty allows the expression of a set of possibilities in a compact description.

For example, the following unbounded dependency relation states that the top of the unbounded dependency is equated with a grammatical function other than ADJUNCT that can be embedded within an unbounded number of grammatical functions at f-structure.

[6] Alsina (2008) independently argues for a single f-structure grammatical function for unbounded dependencies. He calls this single function OP. I prefer the term UDF, because OP has a semantic connotation which is not appropriate for all instances of UDF.

[7] It does not matter here whether unbounded anaphoric binding is made up of a series of more local relations, as in Kratzer (2008), or not.

(54) (↑ UDF) = (↑ GF* [GF − ADJUNCT])

The expression GF* contains two sorts of functional uncertainty. The first is a simple disjunction over grammatical functions, since GF stands for any grammatical function. The second is the more interesting and uses Kleene star to allow the UDF function to be equated with a grammatical function that is embedded in zero or more grammatical functions, starting at the same f-structure that contains UDF. The Kleene operators thus give the required notion of unboundedness.

Functional equality yields a very strong notion of equality, namely token equality. The very same token f-structure is the value of two grammatical function attributes, the UDF grammatical function that represents the top of the unbounded dependency and whatever grammatical function is associated with the base of the unbounded dependency. Token equality is a stronger notion of equality than the type equality found in typical formulations of the copy theory of movement (Chomsky 1993), although it may be equivalent to multidominance approaches (Gärtner 1997, 2002, Johnson 2007). In type equality, the two instances in question may have separate properties. For example, one instance may undergo Delete, without the other instance undergoing the operation. Similarly, one instance may be interpreted without the other instance being interpreted. None of these distinctions are possible under token identity, because *there is only one instance*.

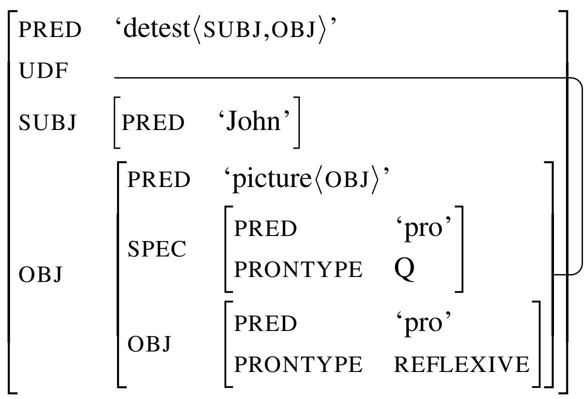
5.4.1 Reconstruction

Reconstruction (Lebeaux 1990, Chomsky 1993) is a good illustration of the consequences of token versus type equality. If the top and base of an unbounded dependency (and possibly intermediate positions, but this is a complication that does not affect the main point) are only type-equal, then one can meaningfully ask whether it is the top or the base that some given syntactic operation or constraint applies to. Reconstruction is then a separate operation or stipulation of the theory. In contrast, reconstruction is an unavoidable consequence of token equality, because the very same element occupies multiple positions. It is not meaningful to ask whether the top or the base is subject to some operation or constraint, because we are really talking about the very same thing. There is thus no necessity for any operation of reconstruction. Token equality is therefore the strongest possible theory of reconstruction phenomena.

Reconstruction follows from token equality at f-structure, since the filler serves two grammatical functions. I will use reflexive-binding reconstruction for expository purposes only (such cases may in fact depend on a logophoric or 'exempt' reading of the reflexive; Pollard and Sag 1992, Reinhart and Reuland 1993, Asudeh and Keller 2001, Runner et al. 2002).

(55) Which pictures of himself does John detest?

(56)



If we compare the f-structure for (55) to the f-structure for (57), we see that the very same f-structural relations hold of the picture NP in both cases; in particular it is f-commanded (Bresnan 1982a) by the SUBJ in both cases:

(57) John detests these pictures of himself.

(58)
$$\begin{bmatrix} \textsc{pred} & \text{‘detest}\langle\textsc{subj,obj}\rangle\text{’} \\ \textsc{subj} & \begin{bmatrix} \textsc{pred} & \text{‘John’} \end{bmatrix} \\ \textsc{obj} & \begin{bmatrix} \textsc{pred} & \text{‘picture}\langle\textsc{obj}\rangle\text{’} \\ \textsc{spec} & \begin{bmatrix} \textsc{pred} & \text{‘pro’} \\ \textsc{prontype} & \textsc{demonstrative} \end{bmatrix} \\ \textsc{obj} & \begin{bmatrix} \textsc{pred} & \text{‘pro’} \\ \textsc{prontype} & \textsc{reflexive} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

The usual reconstruction asymmetry between negative and positive binding constraints (Guilliot and Malkawi 2006) follows, because negative constraints are understood with universal force and no occurrence of the prohibited structural relation is tolerated, whereas positive constraints are understood with existential force and are satisfied if there is some occurrence of the required structural relation.

The LFG theory of reconstruction also naturally predicts asymmetry between structurally-sensitive conditions such, as Principle C of binding theory (normally stated in terms of some structural command relation) and cases that do not necessarily involve structural conditions, such as quantificational binding (Rouveret 2002). Glue Semantics, the theory of the syntax–semantics interface and semantic composition assumed in much LFG work, including here, does not require quantifiers to necessarily command their ‘variables’ (for related discussion, see Shan and Barker 2006). Syntactic reconstruction of the kind involved in binding theory is therefore distinct from what one might otherwise call reconstruction of quantifier scope. This points the way to a theory in which distinctions in reconstruction (Bianchi 2008) could be captured, but much more work needs to be done.

5.4.2 Constraints on extraction

Further constraints can be placed on the **Top**, **Body** or **Base** of the unbounded dependency. For example, (54) illustrates the use of regular language complementation to exclude ADJUNCTs from the base of the unbounded dependency. Another similar example is the following equation

(59) $(\uparrow \textsc{udf}) = (\uparrow \textsc{gf}^{*}\ \textsc{subj})$

This equations states that the unbounded dependency must terminate in a subject:

Island constraints (Ross 1967) are captured through constraints on **Body** and **Base**. For example, consider the illustrative equation in (60).

(60) $(\uparrow \textsc{udf}) = (\uparrow \{\textsc{xcomp} \mid \textsc{comp}\}^{*}\ \{\textsc{subj} \mid \textsc{obj}\})$

This equation captures the Sentential Subject Constraint because **Body** does not contain SUBJ; the unbounded dependency cannot pass through a SUBJ f-structure, only through a XCOMP or COMP. It also captures the Left Branch Condition, because the **Base** does not contain SPEC.

Constraints on extraction are also captured through *off-path* constraints (Dalrymple 1993), which place restrictions on f-structures found along the **Body** path. Off-path constraints can be defined as in (27), following Dalrymple (2001: 151):

(61) a. In an expression $\underset{(\leftarrow s)}{a}$, $\leftarrow$ refers to the f-structure of which a is an attribute.

b. In an expression $\underset{(\rightarrow s)}{a}$, $\rightarrow$ refers to the value of the attribute a.

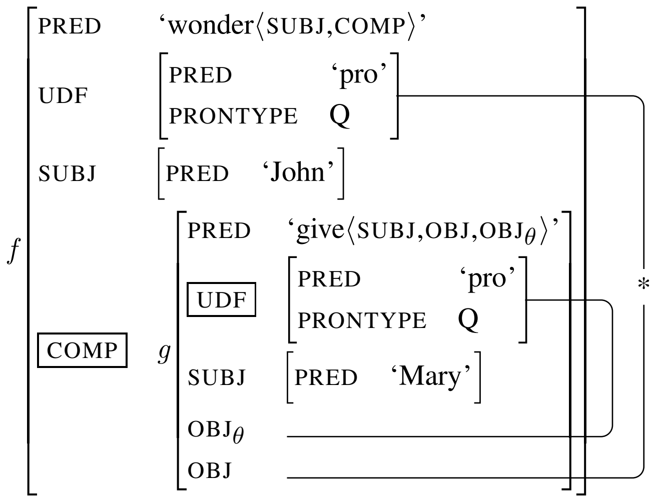
For example, *wh*-islands can be captured with an equation like the following, which states that no GF on the path to the base can have its own UDF function:

(62) $(\uparrow \textsc{udf}) = (\uparrow \underset{\neg(\rightarrow\ \textsc{udf})}{\textsc{gf}^*}\ \textsc{gf})$

The *wh*-island violation example (63) has the f-structure in (64).

(63) *Who did John wonder what Mary gave?

(64)



Instantiated version of (62) for this f-structure

$(f\ \textsc{udf}) = (f\ \underset{\neg(g\ \textsc{udf})}{\textsc{comp}}\ \textsc{obj})$

The first GF that the unbounded dependency passes through is the matrix COMP. This COMP itself contains a UDF, due to the lower extraction of *what*. The structure is therefore excluded if the grammar contains constraint (62).

5.5 Operations on f-structures: Restriction

F-structures are sets of attribute-value pairs (attribute-value matrices). This gives rise to certain natural operations. Restriction is an operation of this sort that will be particularly important to the analysis of syntactically inactive resumptives. The restriction of some f-structure f by an attribute a, designated $f \backslash a$, is the f-structure that results from deleting the attribute a and its value v from f-structure f (Kaplan and Wedekind 1993: 198). In other words, the pair $\langle a, v\rangle$ is removed from the set of pairs that constitutes the f-structure in question.

Restriction is formally defined as follows:

(65) **Restriction** (Kaplan and Wedekind 1993: 198)

If f is an f-structure and a is an attribute:

$f \backslash a = f|_{\text{Dom}(f)\text{-}\{a\}} = \{\ \langle s, v\rangle \in f \mid s \neq a\ \}$

The restriction of an f-structure is itself an f-structure, so the operation can be iterated, but the outcome is not order-sensitive; restriction is associative and commutative in its attribute argument: $[f \backslash a] \backslash b = [f \backslash b] \backslash a = f \backslash \{a\ b\}$ (Kaplan and Wedekind 1993: 198). Since restriction is defined in terms of set complementation, restriction of an f-structure by an attribute that the f-structure does not contain vacuously succeeds. We never need to know in advance whether an f-structure actually contains the restricting attribute. Kaplan and Wedekind (1993: 199) also further generalize the operator to attributes whose values are sets.

In (66) we see an example of an f-structure with restriction by the attribute PRED.

(66) a. $f = \begin{bmatrix} \textsc{pred} & \text{'pro'} \\ \textsc{case} & \textsc{nom} \end{bmatrix}$

b. $f \backslash \textsc{pred} = \begin{bmatrix} \textsc{case} & \textsc{nom} \end{bmatrix}$

This example demonstrates the subsumptive relation between an f-structure and its restriction: $f\backslash a$ subsumes f ($f\backslash a \sqsubseteq f$). In other words, the restriction of a given f-structure never contains more information than that f-structure.

As an operation on f-structures, restriction can be combined with usual function-application as follows (Kaplan and Wedekind 1993: 198):

(67) If f and g are f-structures, then $f\backslash a = g\backslash a$ is true if and only if f and g have all attributes and values in common other than a; they may or may not have values for a and those values may or may not be identical.

Restriction thus serves a complementary role to standard function-application defining equations like $(f\ a) = (g\ a)$, which states that f-structures f and g both have attribute a with the same value, but remains uncommitted as to what other attributes and values the f-structures have in common. The standard (unrestricted) function-application equality designates (explicitly names) which attributes and values two f-structures necessarily have in common, whereas the restricted version designates which attributes two f-structures do not necessarily have in common.

5.6 Generalizations over descriptions

Dalrymple et al. (2004) define a method for capturing generalizations over LFG structural descriptions, such as the set of formal statements (i.e., equations and constraints) associated with a lexical entry. Subsets of these statements can be named and the name used to refer to that set of statements. Lexical generalizations in LFG are thus stated in terms of relations between descriptions of structures, rather than between the structures themselves (cf. type hierarchies in HPSG; Pollard and Sag 1994).

Consider a verb like *laughs*, which could have a lexical entry like the following:

(68) *laughs*, V
$(\uparrow \text{PRED}) = \text{`laugh}\langle\text{SUBJ}\rangle\text{'}$
$(\uparrow \text{VFORM}) = \text{FINITE}$
$(\uparrow \text{TENSE}) = \text{PRESENT}$
$(\uparrow \text{SUBJ PERS}) = 3$
$(\uparrow \text{SUBJ NUM}) = \text{SG}$

All of the f-structural information in this entry, except for the PRED value, is shared by other verbs. Therefore, it should be factored out in such a way that each verb needs only state the minimal information that is particular to that verb. The generalization templates below achieve this:[8]

(69) PRESENT = $(\uparrow \text{VFORM}) = \text{FINITE}$
$(\uparrow \text{TENSE}) = \text{PRESENT}$

(70) 3SGAGR = $(\uparrow \text{SUBJ PERS}) = 3$
$(\uparrow \text{SUBJ NUM}) = \text{SG}$

(71) INTRANSITIVE(P) = $(\uparrow \text{PRED}) = \text{`P}\langle\text{SUBJ}\rangle\text{'}$

The last of these templates illustrates template parametrization with an argument. The argument P is passed to the template when the template is invoked.

Given these generalization templates, the lexical entry for *laughs* can now equivalently be written as (72), where @X indicates invocation of a template X:

(72) *laughs*, V
@INTRANSITIVE(laugh)
@PRESENT
@3SGAGR

These three template invocations result in exactly the same information as in (68). Templates thus provide a convenient way to associate grammatical information with classes of items, rather than with individual items, and to maximally compact lexical entries and rule annotations.

[8] Dalrymple et al. (2004) present further factorizations.

6 Glue Semantics[9]

Glue Semantics (Dalrymple 1999, 2001, Asudeh 2004, Lev 2007, Kokkonidis 2008) is a theory of semantic composition and the syntax–semantics interface. Glue *meaning constructors* are obtained from lexical items instantiated in particular syntactic structures and can also be directly associated with phrase structure positions (as an alternative to null categories; e.g. for reduced relatives). Each constructor has the following form:

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

$\mathcal{M}$ is a term from some representation of meaning, a *meaning language*, and G is a term of the Glue logic that sticks meanings together, i.e. performs composition. The colon is an uninterpreted pairing symbol. Linear logic (Girard 1987) serves as the Glue logic (Dalrymple et al. 1993, 1999a,b). 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 for a sentence terminates in a meaning constructor of type t:

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

Semantic ambiguity (e.g., scope ambiguity) results when there are alternative derivations from the same set of premises. Linear logic is a *resource logic*: each premise in valid linear logic proof must be used exactly once. The resource sensitivity of linear logic forms the theoretical heart of the Resource Sensitivity Hypothesis and the Resource Management Theory of Resumption; it will be explored in section 7.

As discussed in detail by Dalrymple et al. (1999a), Glue Semantics is essentially a type-logical theory and is thus related to type-logical approaches to Categorial Grammar (Morrill 1994, Moortgat 1997, Carpenter 1997, Jäger 2005). The key difference between Glue and Categorial Grammar concerns grammatical architecture, particularly the conception of the syntax–semantics interface (Asudeh 2004, 2005, 2006). Glue Semantics posits a strict separation between syntax and semantics, such that there is a syntax that is separate from the syntax of semantic composition. Categorial Grmamar rejects the separation of syntax from semantic composition. The acceptance of a separate level of syntax allows the Glue logic for semantic composition to be commutative, permitting reordering of premises, without wildly overgenerating illicit word orders. In turn, this means that certain operations of semantic composition are somewhat more straightforward in Glue than in Categorial Grammar. For example, in a variable-free treatment of anaphora in which pronouns are functions on their antecedents, as demonstrated in section 6.1 below, Glue Semantics allows direct application of the pronoun to its antecedent, since the fact that the two do not occur contiguously is not relevant, given commutativity. In contrast, Categorial Grammar treatments — which must posit a non-commutative logic in order to properly constraint word order — require mechanisms for passing the pronominal information through the categories that intervene between the pronoun and its antecedent, such as special type shifts (Jacobson 1999) or special operators and corresponding proof rules (Jäger 2005).

I assume a small, rather weak fragment of linear logic, which I have presented in detail elsewhere as multiplicative intuitionistic linear logic (MILL; Asudeh 2004, 2005). Three proof rules of this fragment are of particular interest here. In natural deduction style, these are conjunction elimination for $\otimes$ — one of two conjunctions in linear logic — and implication introduction and elimination for $\multimap$ (a.k.a. 'abstraction' or 'hypothetical reasoning' for implication introduction and 'modus ponens' for elimination), as shown in (75).

[9] This section is adapted from Asudeh (2005: 388–399).

(75) Implication Elimination / Implication Introduction / Conjunction Elimination

$$\dfrac{\begin{matrix}\vdots \\ A\end{matrix} \qquad \begin{matrix}\vdots \\ A \multimap B\end{matrix}}{B}\multimap_{\mathcal{E}} \qquad\qquad \dfrac{\begin{matrix}[A]^1 \\ \vdots \\ B\end{matrix}}{A \multimap B}\multimap_{\mathcal{I},1} \qquad\qquad \dfrac{\begin{matrix}\\ \vdots \\ A \otimes B\end{matrix} \qquad \begin{matrix}[A]^1 \; [B]^2 \\ \vdots \\ C\end{matrix}}{C}\otimes_{\mathcal{E},1,2}$$

A premise in brackets with a numerical flag indicates an assumption; the flags keep track of which assumptions have been withdrawn and which are active. In additon to these three rules, I assume the trivial rule of Universal Elimination (a.k.a. 'universal instantion') for universal quantification on the linear logic side of meaning constructors. This quantification is a method for scope underspecification and should not be confused with quantification in the meaning language.

The proof rules for linear logic construct proof terms via the Curry-Howard isomorphism (a.k.a. "formulas-as-types"; Curry and Feys 1958, 1995, Howard 1980), which establishes a formal correspondence between natural deduction and terms in the lambda calculus. The basic insight behind the isomorphism is that implications correspond to functional types, so that implication elimination corresponds to *functional application* and implication introduction corresponds to *abstraction*. The Curry-Howard term assignments for the three rules in (75) are:

(76) Application : Impl. Elim. / Abstraction : Impl. Intro. / Pairwise substitution : Conj. Elim.

$$\dfrac{\begin{matrix}\vdots \\ a : A\end{matrix} \qquad \begin{matrix}\vdots \\ f : A \multimap B\end{matrix}}{f(a) : B}\multimap_{\mathcal{E}} \qquad \dfrac{\begin{matrix}[x : A]^1 \\ \vdots \\ f : B\end{matrix}}{\lambda x.f : A \multimap B}\multimap_{\mathcal{I},1} \qquad \dfrac{\begin{matrix}\\ \vdots \\ a : A \otimes B\end{matrix} \qquad \begin{matrix}[x : A]^1 \; [y : B]^2 \\ \vdots \\ f : C\end{matrix}}{\mathsf{let}\ a\ \mathsf{be}\ x \times y\ \mathsf{in}\ f : C}\otimes_{\mathcal{E},1,2}$$

As noted above, implication elimination corresponds to functional application, and implication introduction corresponds to abstraction. The assumed premise in the introduction rule is associated with a variable that is abstracted over when the assumption is discharged.

The term constructor let is possibly less familiar. A multiplicative conjunction $A \otimes B$ corresponds to a tensor product $a \times b$, where a is the proof term of A and b is the proof term of B. However, let prevents projection into the individual elements of the tensor pair and therefore enforces pairwise substitution (Abramsky 1993, Benton et al. 1993, Crouch and van Genabith 2000: 88), such that a let expression β-reduces as follows (Benton et al. 1993: 82):

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

The substitution of the pair is simultaneous and does not involve projection into the members. So let is just a more structured form of functional application.

A Glue proof for the semantics of a sentence S succeeds if and only if from the premises contributed by the lexical items in S there is a proof that uses each premise exactly once and terminates in a linear logic atom corresponding to the semantic projection of the sentence. For example, in the sentence *Bo chortled* the lexical items *Bo* and *chortled* contribute premises like b and $b \multimap c$, where the premise contributed by *Bo* is identified as the subject of *chortled* in the syntax and is therefore consumed as the argument of the premise $b \multimap c$. The linear logic atom c corresponds to the semantic projection of the sentence *Bo chortled*, because it is the consequent of the premise contributed by of the matrix verb that heads the sentence. From these two premises, there is a successful proof of c by one instance of implication elimination on b and $b \multimap c$:

(78) $$\dfrac{\mathit{bo} : b \qquad \mathit{chortle} : b \multimap c}{\mathit{chortle}(\mathit{bo}) : c}\multimap_{\mathcal{E}}$$

I now turn to brief examples of Glue treatments of anaphora, scope ambiguity and unbounded dependencies; these will hopefully be useful to those who are not familiar with Glue Semantics in understanding some parts of the subsequent analysis.

6.1 Example: Anaphora

Anaphora in Glue Semantics are typically treated as functions on their antecedents (Dalrymple et al. 1999c, Dalrymple 2001) and this is the approach adopted in RMTR. This a kind of a variable-free treatment of anaphora, which has also been adopted in certain Categorial Grammar analyses (Jacobson 1999, Jäger 2005, among others), although the two variable-free traditions developed separately. A variable-free treatment of anaphora is quite natural in Glue, because the commutative linear logic allows anaphora to combine directly with their antecedents, in opposition to the kind of intervening operations that are necessary for variable-free anaphoric resolution in non-commutative Categorial Grammar.

The meaning constructor for a pronominal has the following general form, where $\uparrow$ is the f-structure of the pronoun and $\uparrow_\sigma$ is its σ-projection in sem-structure:

(79) $\lambda z.z \times z : (\uparrow_\sigma \text{ ANTECEDENT}) \multimap [(\uparrow_\sigma \text{ ANTECEDENT}) \multimap \uparrow_\sigma]$

The pronoun's type is therefore $\langle \sigma, \langle \sigma, \tau \rangle \rangle$, where σ is the type of the antecedent and τ is the type of the pronoun. I here assume that both σ and τ are type e (individuals). A pronoun function applies to its antecedent and yields an output that is a pair whose first member is the antecedent and whose second member is the pronoun. It is important that the antecedent is restored in the output, because the antecedent must itself serve as an argument elsewhere. For example, in (80), *Bo* is not only the argument of the pronominal function contributed by *himself*, but also an argument of the function contributed by *fooled*. A proof for example (80) is shown in (81).

(80) Bo fooled himself.

(81)

$$\dfrac{\dfrac{\dfrac{\overset{\textbf{Bo}}{bo : b} \quad \overset{\textbf{himself}}{\lambda z.z \times z : b \multimap (b \otimes p)}}{bo \times bo : b \otimes p}\multimap_{\mathcal{E}} \quad \dfrac{\dfrac{[x : b]^1 \quad \overset{\textbf{fooled}}{\lambda u \lambda v.fool(u,v) : b \multimap p \multimap f}}{\lambda v.fool(x,v) : p \multimap f}\multimap_{\mathcal{E}} \quad [y : p]^2}{fool(x,y) : f}\multimap_{\mathcal{E}}}{\textsf{let } bo \times bo \textsf{ be } x \times y \textsf{ in } fool(x,y) : f}\otimes_{\mathcal{E},1,2}}{fool(bo,bo) : f}\Rightarrow_\beta$$

6.2 Example: Scope ambiguity

Glue Semantics does not assume that every semantic ambiguity corresponds to a syntactic ambiguity. This is demonstrated by scope ambiguity, in which a scopally ambiguous sentence such as (82) has only a single syntactic structure. However, because the scope points are universally quantified over in meaning constructors for quantifiers and quantificational determiners, there can be more than one valid proof derived from a single set of lexically contributed premises as instantiated in the unambiguous syntactic parse. For detailed exposition and further references, see Asudeh (2006). The two valid proofs for (82) are shown in (84) and (85). I assume a theory of generalized quantifiers, such that quantificational determiners have the type $\langle \langle e, t \rangle, \langle \langle e, t \rangle, t \rangle \rangle$. For more details on quantification in Glue Semantics, see Dalrymple (1999, 2001).

(82) Someone recommended every book.

The premise for *recommended* is curried as appropriate. Currying can be trivially executed in the proof itself through a series of assumptions followed by discharge of the assumptions in the order they were made:

(83)
$$\dfrac{\dfrac{\dfrac{\dfrac{\lambda y\lambda x.f(x,y) : b \multimap a \multimap c \quad [v : b]^1}{\lambda x.f(x,v) : a \multimap c}\multimap_{\mathcal{E}} \quad [u : a]^2}{f(u,v) : c}\multimap_{\mathcal{E}}}{\lambda v.f(u,v) : b \multimap c}\multimap_{\mathcal{I},1}}{\lambda u\lambda v.f(u,v) : a \multimap b \multimap c}\multimap_{\mathcal{I},2}$$

I simply assume a curried alternative, rather than executing this sub-proof.

(84) **Surface scope proof**

$$\dfrac{\begin{array}{l}\textbf{someone}\\ \lambda S.some(person,S) :\\ \forall X.(s \multimap X) \multimap X\end{array} \quad \dfrac{\dfrac{\dfrac{[z : s]^1 \quad \begin{array}{l}\textbf{recommended}\\ \lambda x\lambda y.recommend(x,y) :\\ s \multimap b \multimap r\end{array}}{\lambda y.recommend(z,y) : b \multimap r}\multimap_{\mathcal{E}} \quad \dfrac{\begin{array}{l}\textbf{every}\\ \lambda R\lambda S.every(R,S) :\\ (v \multimap r) \multimap \forall Y.(b \multimap Y) \multimap Y\end{array} \quad \begin{array}{l}\textbf{book}\\ book :\\ v \multimap r\end{array}}{\lambda S.every(book,S) : \forall Y.(b \multimap Y) \multimap Y}\multimap_{\mathcal{E}}}{every(book,\lambda y.recommend(z,y)) : r}\forall_{\mathcal{E}},\text{[r/Y]}}{\lambda z.every(book,\lambda y.recommend(z,y)) : s \multimap r}\multimap_{\mathcal{I},1}}{some(person,\lambda z.every(book,\lambda y.recommend(z,y))) : r}\forall_{\mathcal{E}},\text{[r/X]}$$

(85) **Inverse scope proof**

$$\dfrac{\dfrac{\dfrac{\begin{array}{l}\textbf{someone}\\ \lambda S.some(person,S) :\\ \forall X.(s \multimap X) \multimap X\end{array} \quad \dfrac{[z : b]^1 \quad \begin{array}{l}\textbf{recommended}\\ \lambda y\lambda x.recommend(x,y) :\\ b \multimap s \multimap r\end{array}}{\lambda x.recommend(x,z) : s \multimap r}\multimap_{\mathcal{E}}}{some(person,\lambda x.recommend(x,z)) : r}\forall_{\mathcal{E}},\text{[r/X]}}{\lambda z.some(person,\lambda x.recommend(x,z)) : b \multimap r}\multimap_{\mathcal{I},1} \quad \dfrac{\begin{array}{l}\textbf{every}\\ \lambda R\lambda S.every(R,S) :\\ (v \multimap r) \multimap \forall Y.(b \multimap Y) \multimap Y\end{array} \quad \begin{array}{l}\textbf{book}\\ book :\\ v \multimap r\end{array}}{\lambda S.every(book,S) : \forall Y.(b \multimap Y) \multimap Y}\multimap_{\mathcal{E}}}{every(book,\lambda z.some(person,\lambda x.recommend(x,z))) : r}\forall_{\mathcal{E}},\text{[r/Y]}$$

6.3 Example: Unbounded dependencies

I make the standard assumption that operators in unbounded dependencies have the same type as quantifiers. Scoping of these operators is therefore treated just like quantifier scope. A proof for the scopally unambiguous example (86) is shown in (87).

(86) Who did Bo fool?

(87)
$$\dfrac{\begin{array}{l}\textbf{who}\\ \lambda P.Q(person,P) :\\ \forall X.(w \multimap X) \multimap X\end{array} \quad \dfrac{\begin{array}{l}\textbf{Bo}\\ bo : b\end{array} \quad \begin{array}{l}\textbf{fool}\\ \lambda x\lambda y.fool(x,y) : b \multimap w \multimap f\end{array}}{\lambda y.fool(bo,y) : w \multimap f}\multimap_{\mathcal{E}}}{Q(person,\lambda y.fool(bo,y)) : f}\multimap_{\mathcal{E}},\text{[f/X]}$$

7 Resource Sensitivity

The theoretical foundation for the Resource Management Theory of Resumption (RMTR) is the Resource Sensitivity Hypothesis:

(88) **Resource Sensitivity Hypothesis (RSH)**
Natural language is resource-sensitive.

In this section I will examine the formal theory behind they hypothesis. RSH stems from the resource-logical perspective on semantic composition in Glue Semantics, which in turn stems from that theory's adoption of linear logic as the logic of composition. Asudeh (2004: 74–76) also discusses the hypothesis in relation to syntax and phonology.

It is useful to separate Logical Resource Sensitivity, a property of logics, from Linguistic Resource Sensitivity, a property of languages:

(89) **Logical Resource Sensitivity**:
In a resource logic, premises in proofs cannot be freely *reused* or *discarded*.

(90) **Linguistic Resource Sensitivity**:
Natural language is resource-sensitive: elements of combination in grammars cannot be freely *reused* or *discarded*.

Linguistic Resource Sensitivity is just RSH, but phrased in such a way that its relationship to Logical Resource Sensitivity is clarified. Linguistic Resource Sensitivity is Logical Resource Sensitivity plus additional constraints on proof goals motivated by linguistic theory. I here assume that a sentential proof must terminate in type t; see Asudeh (2004: 86–87) for discussion of alternative proof goals.

Logical Resource Sensitivity is best-understood through the concept of *substructural logics*, which can be characterized as follows (Restall 2000: 1–2):

> Substructural logics focus on the behaviour and presence — or more suggestively, the *absence* — of *structural rules*. These are particular rules in a logic which govern the behaviour of collections of information. (emphasis in original)

The set of structural rules that a substructural logic contains characterizes an informational system. A unifying guiding principle of modern linguistics is the characterization of language as information, whether from a logical/computational perspective, as in the 'logic, language and information' tradition, or from a cognitive perspective, as in the 'knowledge of language' tradition.

The three structural rules that are of particular interest here are *weakening*, *contraction* and *commutativity*:

(91)

Weakening	*Contraction*	*Commutativity*
$\dfrac{\Gamma \vdash B}{\Gamma, A \vdash B}$	$\dfrac{\Gamma, A, A \vdash B}{\Gamma, A \vdash B}$	$\dfrac{\Gamma, A, B \vdash C}{\Gamma, B, A \vdash C}$

The intuitions behind these rules can be stated as follows:

1. **Weakening:**
   Premises can be *freely added*.

2. **Contraction:**
   Additional occurrences of a premise can be *freely discarded*.

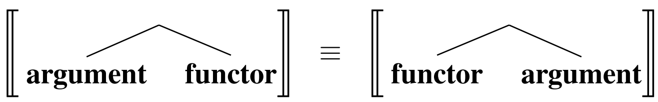
3. **Commutativity:**
   Premises can be *freely reordered*.

A substructural logic that lacks weakening and contraction is a resource logic. Lack of these structural rules means that premises cannot be freely added or discarded. This has the effect that premises in a proof in the logic in question are *resources* that must be strictly accounted for (since they cannot be freely reused or ignored). Weakening and contraction therefore form the basis for Logical Resource Sensitivity. Commutativity characterizes sensitivity to order.

Semantic combinatorics with respect to order-sensitivity and resource-sensitivity can be characterized as follows:

(92) **Semantics**

1. Order unimportant:



2. Elements of semantic combination cannot be freely discarded or reused.

Functor-argument composition is the fundamental insight behind semantic composition (Frege 1891/1952). Order is irrelevant to this sort of composition: a functor can equally well combine with an argument to its left or to its right. There can of course be syntactic constraints on the distribution of the syntactic realizations of functors and arguments, but this is semantically irrelevant. For example, an intransitive verb in English always follows the subject. If the verb is the functor and the subject is the argument then we have right-left functor-argument order. However, the subject can be type-shifted such that it consumes the verb as an argument. In this case we have left-right functor-argument order. It is the types of the expressions that determine functor-argument combination, not their order. For example, in their rule for Functional Application, Heim and Kratzer (1998: 44,95) simply state that the functor applies to the argument, regardless of order.

Semantics is, however, resource-sensitive. We cannot simply disregard contentful expressions or use single occurrences of contentful expressions more than once. Two examples will serve to clarify:

(93) Kim fooled Sandy.

(94) This innocent man is allegedly guilty, according to some.

The meanings of the words *Kim*, *Sandy*, and *fooled* in (93) can each be used to produce the meaning in (95), but it is not possible to disregard the meaning of *Sandy* and to use the meaning of *Kim* twice to derive the meaning in (96).

(95) $\mathit{fool}(\mathit{kim}, \mathit{sandy})$

(96) $\mathit{fool}(\mathit{kim}, \mathit{kim})$

Similarly, we cannot use the single occurrence of the adverb *allegedly* twice to give (94) a meaning equivalent to that of (97).

(97) This allegedly innocent man is allegedly guilty, according to some.

The two sentences are truth-conditionally distinct, since (94) entails that the man is innocent, whereas (97) does not. In sum, the fundamental combinatorics of semantics is not order-sensitive but is resource-sensitive. The understanding of the logic of semantic composition would therefore benefit from focusing on resource logics — i.e., logics that satisfy Logical Resource Sensitivity by lacking weakening and contraction.

A resource logic that is of central interest in proof theory and substructural logic is *linear logic* (Girard 1987, 1989). Tables 2 and 3 contrast two well-known non-resource-sensitive logics — classical logic and intuitionistic logic — with linear logic. Figure 2 shows that in non-resource-sensitive logics we can use a premise in deriving some conclusion and then reuse the premise. In this case a conditional and its antecedent yield the conditional's conclusion (by modus ponens) and the antecedent is then conjoined with the conclusion. This is not possible in linear logic: the antecedent premise is used up in deriving the conclusion and cannot be reused to be conjoined with the result (recall that $\multimap$ is linear implication and $\otimes$ is (multiplicative) linear conjunction). Figure 3 shows the opposite situation. In classical or intuitionistic logic, if we have two premises we can ignore one and just conclude the other. This is not possible in linear logic: we cannot just leave one premise aside. It must be used in the proof. Classical logic is characterizable as a logic of truth and intuitionistic logic as a constructive logic of consequence or proof (Gamut 1991, van Dalen 2001). Linear logic captures the intuitionistic notions of constructions, proofs and consequence but is also a resource logic that requires strict use of resources.

Linear logic is an appropriate choice for modeling semantic composition for a number of reasons. First, it is a logic of resources and therefore models the apparent resource sensitivity of natural language semantics. Second, it is a pure logic of composition for semantics, since it lacks commutativity

Classical/Intuitionistic Logic	Linear Logic
$A, \quad A \rightarrow B \vdash B$	$A, \quad A \multimap B \vdash B$
$A, \quad A \rightarrow B \vdash B \wedge A$	$A, \quad A \multimap B \nvdash B \otimes A$
Premise A reused,	Premise A is consumed to produce conclusion B,
conjoined with conclusion B	no longer available for conjunction with B

Table 2: Logical Resource Sensitivity: no reuse of premises/resources

Classical/Intuitionistic Logic	Linear Logic
$A, B \vdash A$	$A, B \nvdash A$
Can ignore premise B	Cannot ignore premise B

Table 3: Logical Resource Sensitivity: no discarding premises/resources

and we have seen that order of composition is irrelevant for semantics. A different option is to use a non-commutative resource logic with controlled commutativity, as in *Multimodal Type Logic* (see discussion and references in Moortgat 1997), to simultaneously model syntax and semantic composition. This is certainly an option, but faces the danger of conflating properties of syntactic and semantic combination by failing to separate syntax, where order is fairly relevant, from semantics, where order is irrelevant. There may be complexities that arise in controlling syntactic or semantic combination, but these will not be localized in syntax or semantics and will instead infect the system as a whole. Using linear logic for semantic combination in contrast keeps syntax and semantics separate, as will be discussed further shortly, and therefore to a large extent quarantines one from the other. Finally, the use of linear logic for semantic composition forms a bridge between linguistics and proof theory, a burgeoning field at the intersection of logic, theoretical computer science and mathematics. Linear logic was devised largely as an investigation into properties of proofs (Girard 1987), rather than resources per se, and has led to a productive and influential research programme in proof theory (see Girard 1989 for a classic presentation and Girard 1995 for an overview).

7.1 Some consequences of resource sensitivity

Asudeh (2004: 87–100) argues that linguistic resource sensitivity explains a disparate set of theoretical postulates, such as:

1. Bounded Closure (Klein and Sag 1985)
2. Completeness and Coherence (Kaplan and Bresnan 1982)
3. The Theta Criterion (Chomsky 1981)
4. The Projection Principle (Chomsky 1981)
5. No Vacuous Quantification (Chomsky 1982, 1995, Heim and Kratzer 1998)
6. Full Interpretation (Chomsky 1986, 1995)
7. The Inclusiveness Condition (Chomsky 1995)
8. Interpret Once under Agree (Adger and Ramchand 2005)

The last condition is not discussed in Asudeh (2004), but it is clearly a postulate of the some kind as the others.

What all of these have in common is that they are meant to control the occurrence and interpretation of grammatical elements such that the element must occur exactly once or be interpreted exactly once per occurrence. This naturally leads to some redundancy in cases where a theory subscribes to multiple conditions. More generally, though, the conditions are serving a kind of resource-accounting role that can be immediately taken over by linguistic resource sensitivity instead. That is, once we have, for example, resource-sensitive semantic composition, we do not need most of these principles as separate theoretical postulates, although they may be maintained for independent, non-resource-accounting roles they play, if there are any. I should mention that in what follows I do not enact this programme, but rather assume Completeness and Coherence as f-structure well-formedness conditions, as in standard LFG theory.

For example, consider Full Interpretation, which arguably plays only a resource-accounting role. Chomsky (1986: 99) suggests the following as examples that FI is meant to block:

(98) I was in England last year [the man]

(99) John was here yesterday [walked]

(100) [who] John saw Bill

(101) [every] everyone was here

All these cases, and all other cases where FI is appealed to that I am aware of, are correctly predicted to be ill-formed on the RSH assumption that contentful elements constitute resources for semantic composition (Logical Resource Sensitivity) and that there is a particular goal type for a sentence (Linguistic Resource Sensitivity), which all theories of composition must assume in some form or other. In contrast to RSH, which is well-formalized in logical terms, FI is not well-formalized. Furthermore, RSH is a consequence of the underlying system of composition, whereas FI is an extra stipulation. Lastly, FI is typically understood as a transderivational economy condition (Chomsky 1995: 200) and is therefore computationally inefficient (Johnson and Lappin 1999). In contrast, RSH is a consequence of Logical Resource Sensitivity, which is a condition on a single proof structure.

8 The Resource Management Theory of Resumption

RMTR is based on a theoretical assumption, RSH, and an empirical observation, McCloskey's generalization:

1. **Resource Sensitivity**:
   Natural language is resource-sensitive.

2. **McCloskey's Generalization**:
   Resumptive pronouns are ordinary pronouns.

The logic behind the theory is as follows. If a resumptive pronoun is an ordinary pronoun, then it constitutes a surplus resource. If Resource Sensitivity is to be maintained, then there must be an additional consumer of the pronominal resource present.

The resource surplus constituted by a resumptive pronoun can be demonstrated by an example from English, which does not have grammatically licensed resumptives in majority dialects (Sells 1984, Asudeh 2004, McCloskey 2006):

(102) *Every clown who Mary tickled <u>him</u> laughed.

It is sufficient to look at the linear logic resources to reveal the resource surplus problem for composition, since the meaning terms follow by the Curry-Howard isomorphism.

The linear logic content of the meaning constructors that are contributed by the lexical items in (102) is as shown in (103). All resources are named mnemonically; the convention assumed is to generally use the first letter of the word or feature that introduces the resource and to use p for a pronoun (if further clarification is required, see Asudeh 2004: 60–61 or Asudeh 2005: 395–396).

(103)

1.	$(v \multimap r) \multimap \forall X.[(c \multimap X) \multimap X]$	Lex. **every**
2.	$v \multimap r$	Lex. **clown**
3.	$(p \multimap t) \multimap [(v \multimap r) \multimap (v \multimap r)]$	Lex. **who**
4.	m	Lex. **Mary**
5.	$m \multimap p \multimap t$	Lex. **tickled**
6.	$c \multimap (c \otimes p)$	Lex. **him**
7.	$c \multimap l$	Lex. **laughed**

The common noun *clown* contributes a type $\langle e, t \rangle$ resource, an implication from its s(emantic)-strucure VARIABLE (v) to its RESTRICTION (r). The quantificational determiner *every* contributes a resource of type $\langle \langle e, t \rangle , \langle \langle e, t \rangle , t \rangle \rangle$ that consumes the resource of the common noun to find its restriction and consumes any dependency on the matrix subject resource c to find its scope. In this case it consumes the resource contributed by the matrix verb. The name *Mary* refers to an individual and contributes a type e resource. The pronoun consumes its antecedent's resource and reproduces it along with its own resource. The antecedent is the DP headed by the common noun *clown*. The verb *tickled* contributes a resource that needs to consume two arguments, the embedded object pronoun and the embedded subject name. The intransitive matrix verb *laughed* contributes a resource that needs to consume one argument, the matrix subject. Lastly, the relative pronoun contributes a resource that performs modification of the relative head by the relative clause. The first argument is the resource corresponding to the relative clause it introduces, i.e. the scope of the relative operator. This is a type $\langle e, t \rangle$ implication from the relativized argument's resource to the resource corresponding to the head of the relative clause. In this case, the relativized argument is the embedded OBJ and the first argument of the modificational resource is therefore $p \multimap k$, which is the resource corresponding to the embedded transitive once it has combined with its subject. The second argument of the relative modifier is the resource being modified, which is that of the head noun (i.e., $v \multimap r$).

A proof for (102) must terminate in the linear logic atom l, because l is the consequent of the premise contributed by the matrix verb *laughed*. A successful proof must use each premise exactly once to derive l. The attempted proof in Figure 1 shows that there is no such proof from the premises in (103). The pronominal resource is identified as the problem. There are other proofs that could be attempted, but none of them could get rid of the resource p. The only consumer of p is the premise $m \multimap p \multimap k$ contributed by the verb *know* in the relative clause. The resource p is the resource corresponding to the relativized object. In order for the body of the relative clause to compose with the relative pronoun, this argument of *know* must not be saturated. Therefore, there is in fact no consumer for the resource p and there is no valid proof of this sentence from the premises in (103). The resumptive pronoun's resource is a surplus resource that leads to proof failure. In other words, if the resumptive pronoun were to saturate its position in the relative clause, then semantic composition of the relative clause with the rest of the sentence would be blocked.

In sum, the resource logic perspective reveals that a resumptive pronoun is a surplus resource. The theory in outline is as follows. If a resumptive pronoun is surplus to the basic compositional requirements of its sentence, but the sentence is nonetheless grammatical, then RSH entails that there must be a consumer of the resumptive pronoun's resource. The resumptive consumer is a further resource that consumes a pronominal resource. These resources are called *manager resources*, because they manage an otherwise unconsumable pronominal resource. A resumptive pronoun language has such manager resources in the portion of its lexical inventory or grammar that concerns unbounded dependencies. A language which does not license resumptive pronouns in unbounded dependencies lacks manager resources in its grammar.

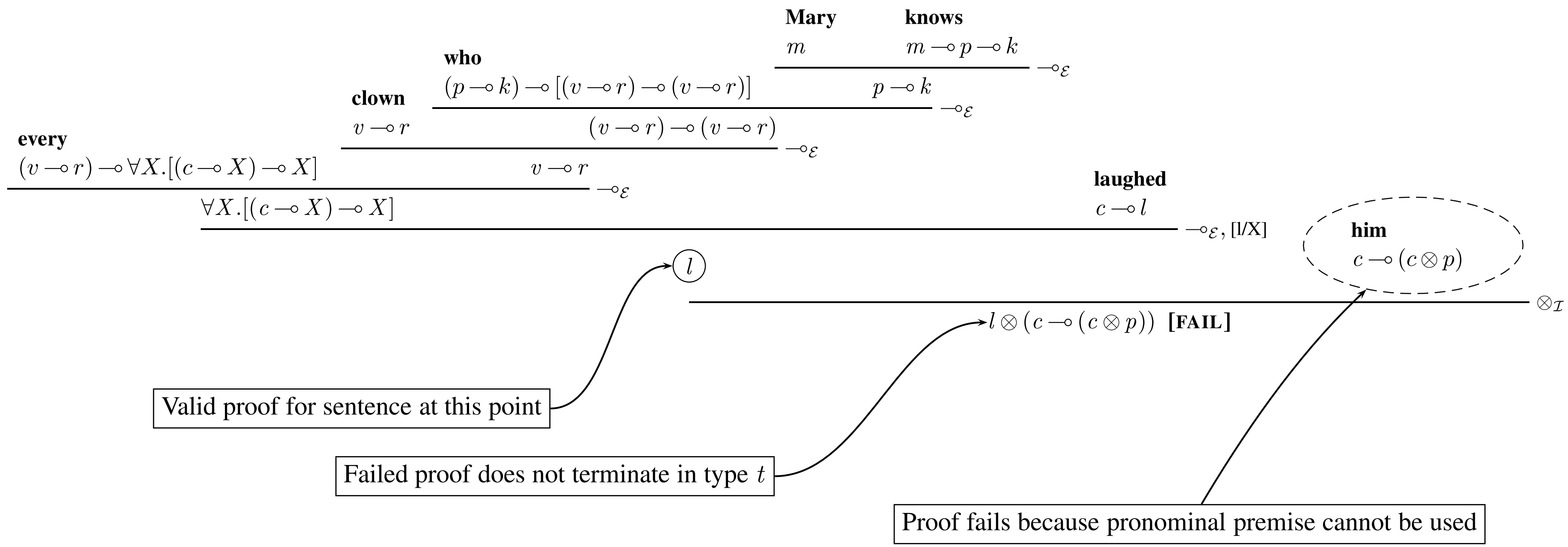


Figure 1: Proof failure due to a surplus resumptive pronoun resource

8.1 Manager resources

Manager resources have the following general compositional schema, where P is some pronoun that the lexical contributor of the manager resource can access and A is the antecedent or binder of P:

(104) $(A \multimap A \otimes P) \multimap (A \multimap A)$

The antecedent of the main implication in (104) has the form of a pronominal meaning constructor: a manager resource needs to consume a pronominal resource.

The resources corresponding to the manager resource, the resumptive pronoun and the binder of the resumptive pronoun together yield just the binder. If the binder of the resumptive is a simple e nominal, such as a name, then we have the following schematic lexically contributed premises:

(105)
1. A — Lex. **(antecedent)**
2. $A \multimap (A \otimes P)$ — Lex. **(pronoun)**
3. $[A \multimap (A \otimes P)] \multimap (A \multimap A)$ — Lex. **(manager resource)**

Figure 2 shows the simple linear logic proof that is constructed from these premises. The proof terminates in the antecedent resource. The manager resource has removed the pronoun from composition. It is important that the consequent of the main implication in the manager resource is itself an implication on the pronoun's binder ($A \multimap A$), rather than just another instance of the binder's resource (A). In the latter case, there would be a new copy of the resource A and this would lead to a resource management problem, as there would be two copies of A where only one is required. This should be intuitively clear if one bears in mind that the role of the manager resource is to consume a pronominal resource, leaving the rest of the proof undisturbed.

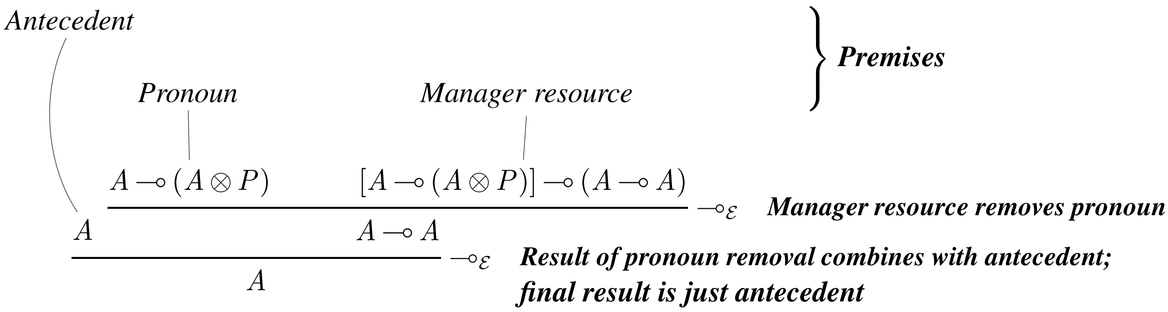


Figure 2: A manager resource in action (binder of lower type)

If the binder is a quantifier, we would instead get the following schematic meaning constructors for the binder of the resumptive, the resumptive pronoun, and the manager resource.

(106)
1. $\forall X.[(A \multimap X) \multimap X]$ — Lex. **(quantificational binder)**
2. $A \multimap (A \otimes P)$ — Lex. **(pronoun)**
3. $[A \multimap (A \otimes P)] \multimap (A \multimap A)$ — Lex. **(manager resource)**

The premise marked *Antecedent* in Figure 2 is replaced by an assumption of a type e resource on which the quantificational binder's scope depends. The manager resource consumes the pronoun and then modifies the assumption. The resulting resource A is taken as an argument by the scope of the quantificational binder. The assumption is then discharged and the scope can compose with the quantifier. This is sketched in Figure 3. Notice that the boxed proof chunk in Figure 3 is equivalent to Figure 2.

The basic function of the manager resource is to remove the pronoun from composition. A resumptive pronoun that is licensed by a manager resource behaves syntactically exactly like a non-resumptive pronoun, but behaves semantically like a gap: the semantic argument position corresponding to the pronoun gets saturated by the pronoun's antecedent or bound by the pronoun's binder, rather

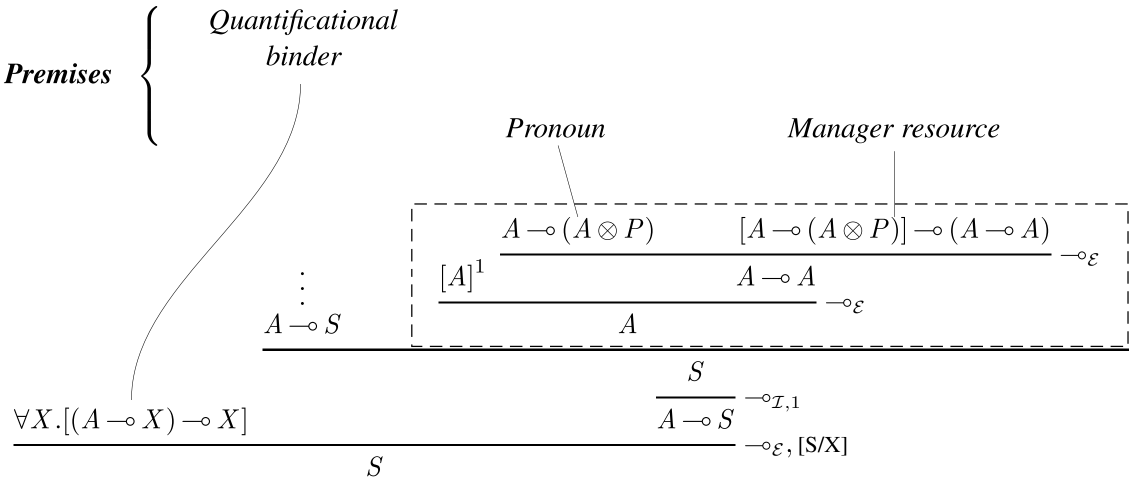


Figure 3: A manager resource in action (quantificational binder)

than being saturated by the pronoun. The fact that a manager resource removes a pronoun from semantic composition is reflected in the meaning side of the manager resource's meaning constructor by vacuous lambda abstraction over the pronoun's function. The function in the meaning language that corresponds to the modification on the antecedent resource is an identity function.

(107) $\lambda P \lambda x.x : (A \multimap A \otimes P) \multimap (A \multimap A)$

A manager resource is therefore a type $\langle\langle e, \langle e \times e\rangle\rangle, \langle e, e\rangle\rangle$ function. Its role is exclusively to remove a pronoun from semantic composition, without affecting the rest of the composition at all.

The proof in (109) shows the meaning language side of Figure 2. The proof is constructed from the lexically contributed premises in (108), which are just the premises in (105) with the meaning side of the meaning constructors added.

(108)
1. $a : A$ Lex. **(antecedent)**
2. $\lambda z.z \times z : A \multimap (A \otimes P)$ Lex. **(pronoun)**
3. $\lambda P \lambda x.x : [A \multimap (A \otimes P)] \multimap (A \multimap A)$ Lex. **(manager resource)**

(109)
$$\dfrac{a : A \qquad \dfrac{\lambda z.z \times z : A \multimap (A \otimes P) \qquad \lambda P \lambda x.x : [A \multimap (A \otimes P)] \multimap (A \multimap A)}{\lambda x.x : (A \multimap A)}\multimap_{\mathcal{E}}}{a : A}\multimap_{\mathcal{E}},\ \Rightarrow_{\beta}$$

In sum, a manager resource removes a pronoun from semantic composition, but there is no underlying difference postulated between resumptive and non-resumptive pronouns. The resumptive pronoun is an ordinary pronoun that makes a normal syntactic contribution and a normal resource contribution for semantic composition.

At this stage it will be useful to look at the derivation for a full sentence containing a resumptive in order to see in some detail how resumptives work according to this theory. I will abstract away from language-particular details by using English words for expository purposes. This should *not* be taken as an implicit claim that English has grammaticized resumptive pronouns.

(110) Every clown who$_{pro}$ Mary tickled him laughed.

Let us suppose that *who$_{pro}$* is a relative pronoun that licenses a resumptive pronoun. The proof in Figure 4 shows how the lexically-contributed linear logic resources (see Asudeh 2004: 147 for details) result in the meaning of the sentence. The operations in the meaning language follow straightforwardly by the Curry-Howard isomorphism. The manager resource removes the pronoun from composition (the first line of Figure 4), clearing the way for the argument corresponding to the pronoun in the semantics to be bound by the pronominal binder, *every clown*, just as if the relative clause had been a non-resumptive relative. The manager resource removes the pronoun from composition and the proof proceeds as if the pronoun had been a gap.

8.2 Summary

The key idea in the Resource Management Theory of Resumption is that resumption is a problem of resource surplus: the resumptive pronoun's resource apparently goes unconsumed. In languages with grammaticized resumptives, the actual consumer of the resource is a manager resource and it is the presence of a manager resource that licences a resumptive use of a pronoun. Manager resources operate at the syntax–semantics interface. The result is a theory of resumptives that treats resumptive pronouns as ordinary pronouns in the syntax and ties their exceptional ability to occur at the base of an unbounded dependency to the presence of a manager resource.

$$
\dfrac{
  \dfrac{
    \begin{array}{l}\textbf{every}\\ \lambda R \lambda S.every(R,S):\\ (v \multimap r) \multimap \forall X.[(c \multimap X) \multimap X]\end{array}
    \quad
    \dfrac{
      \begin{array}{l}\textbf{clown}\\ clown:\\ (v \multimap r)\end{array}
      \quad
      \dfrac{
        \begin{array}{l}\textbf{who}_{pro}\\ \lambda P \lambda Q \lambda x.Q(x) \wedge P(x):\\ (p \multimap t) \multimap [(v \multimap r) \multimap (v \multimap r)]\end{array}
        \quad
        \dfrac{
          \begin{array}{l}\textbf{Mary}\\ mary:\\ m\end{array}
          \quad
          \begin{array}{l}\textbf{tickled}\\ m \multimap p \multimap t:\\ \lambda x \lambda y.tickle(x,y)\end{array}
        }{\lambda y.tickle(mary,y) : p \multimap t}\multimap_{\mathcal{E}}
      }{\lambda Q \lambda x.Q(x) \wedge tickle(mary,x) : (v \multimap r) \multimap (v \multimap r)}\multimap_{\mathcal{E}}
    }{\lambda x.clown(x) \wedge tickle(mary,x) : (v \multimap r)}\multimap_{\mathcal{E}}
  }{\lambda S.every(\lambda x.clown(x) \wedge tickle(mary,x), S) : \forall X.[(c \multimap X) \multimap X]}\multimap_{\mathcal{E}}
  \quad
  \dfrac{
    \dfrac{
      \begin{array}{l}\textbf{laughed}\\ laugh:\\ c \multimap l\end{array}
      \quad
      \dfrac{
        \dfrac{
          \begin{array}{l}\textbf{him}\\ \lambda z.z \times z:\\ c \multimap (c \otimes p)\end{array}
          \quad
          \begin{array}{l}\textbf{who}_{pro}\ \textbf{(MR)}\\ \lambda P \lambda x.x:\\ [c \multimap (c \otimes p)] \multimap (c \multimap c)\end{array}
        }{\lambda x.x : (c \multimap c)}\multimap_{\mathcal{E}}
        \quad
        [y : c]^1
      }{y : c}\multimap_{\mathcal{E}}
    }{laugh(y) : l}\multimap_{\mathcal{E}}
  }{\lambda y.laugh(y) : c \multimap l}\multimap_{\mathcal{I},1}
}{every(\lambda x.clown(x) \wedge tickle(mary,x), \lambda y.laugh(y)) : l}\multimap_{\mathcal{E}}, [l/X]
$$

Figure 4: Proof for expository resumptive example *Every clown who*$_{pro}$ *Mary tickled him laughed.*

9 Analysis

9.1 Irish resumptives[10]

Irish has been of particular interest in the study of resumptive pronouns and successive cyclic unbounded dependencies, because its complementizer system differentiates between gap-based unbounded dependencies and resumptive-based unbounded dependencies. The distinction is marked either as a morphological distinction on the complementizer or as a morphophonological mutation on the the following word. Filler-gap dependencies are signalled by the leniting complementizer, typically written *aL*, and binder-resumptive unbounded dependencies are signalled by the nasalizing complementizer, typically written *aN* (McCloskey 1979, 1990, 2002, 2006).

The basic multi-clausal patterns for filler-gap (*aL*) dependencies and binder-resumptive (*aN*) dependencies are as follows:

(111) $[_{CP}$ *aL* . . . $[_{CP}$ *aL* . . . $[_{CP}$ *aL* . . . __ . . .]]]

a. an t-ainm a hinnseadh dúinn a bhi __ ar an áit (McCloskey 2002: 190, (13a))
the name *aL* was-told to-us *aL* was __ on the place
'the name that we were told was on the place'

(112) $[_{CP}$ *aN* . . . $[_{CP}$ *go* . . . $[_{CP}$ *go* . . . *Rpro* . . .]]]

a. fir ar shíl Aturnae an Stáit go rabh siad díleas do'n Rí
men *aN* thought Attorney the State *go* were they loyal to-the King
'men that the Attorney General thought were loyal to the King'
(McCloskey 2002: 190, (16))

The basic generalization about filler-gap dependencies is that an instance of the complementizer *aL* marks every clause between the top of the unbounded dependency and the gap. In contrast, the basic generalization for binder-resumptive dependencies is that a single instance of the complementizer *aN* marks the top of the dependency, with every intervening between the top and base of the unbounded dependency being marked by the 'neutral' complementizer *go*, which also introduces clauses that contain no extraction, such as complements of factives, etc.

In addition to these basic patterns, there are three mixed patterns, which I follow McCloskey (2002) in calling 'mixed chains', although I use the term purely pre-theoretically:

(113) $[_{CP}$ *aN* . . . $[_{NP}$ N $[_{CP}$ *aL* . . . __ . . .]]] **Pattern 1**

a. rud a raibh coinne agam a choimhlíonfadh __ an aimsir
thing *aN* was expectation at-me *aL* fulfill.COND __ the time
'something that I expected time would confirm'
(McCloskey 2002: 196, ∼(28))

(114) $[_{CP}$ *aL* . . . $[_{CP}$ *aN* . . . *Rpro* . . .]] **Pattern 2**

[10] A detailed discussion and analysis of Irish unbounded dependencies is given in Asudeh (2004: chapter 4). I can here only provide the basic intuitions and sketch a revised version of the analysis.
An implemented grammar fragment of the analysis of the Irish complementizer system that is presented here and a small test suite of examples can be found at `http://www.carleton.ca/~asudeh/grammars/`. The grammar runs in the Xerox Linguistic Environment (XLE). The grammar does not have a Glue Semantics component and therefore only approximates RMTR, as explained in comments in the grammar. The grammar is meant solely as a test of formal claims about abstract syntactic relationships; it uses English as both the object language and the metalanguage and does not attempt to approximate Irish word order or facts of Irish syntax outside a limited fragment of the unbounded dependency system.

a. aon duine a cheap sé a raibh ruainne tobac aige
any person *aL* thought he *aN* was scrap tobacco at-him
'anyone that he thought had a scrap of tobacco'
(McCloskey 2002: 198, (34))

b. Cé is dóigh leat a bhfuil an t-airgead aige?
who *aL*.COP.PRES likely with-you *aN* is the money at-him
'Who do you think has the money?'
(McCloskey 2002: 198, (35))

(115) $[_{\text{CP}}$ *aN* ... $[_{\text{CP}}$ *aN* ... *Rpro* ...]] **Pattern 3**

a. na cuasáin thiorma ar shíl sé a mbeadh contúirt ar bith uirthi tuitim síos ionnta
the holes dry *aN* thought he *aN* would-be danger any on-her fall.[−FIN] down into-them
'the dry holes that he thought there might be any danger of her falling down into them'
(McCloskey 2002: 199, (44))

I also follow McCloskey's usage in simply calling these Patterns 1, 2 and 3, as indicated. These patterns have been known since the beginning of generative work on Irish resumptives (McCloskey 1978), but they had resisted analysis until recently (McCloskey 2002, Asudeh 2004, Cann et al. 2005).

The core behaviour of *aL* has been long been used as an argument for "success-cyclic movement" (McCloskey 1990) or, more generally, as an indication that filler-gap unbounded dependencies consist of a number of short links (at least in languages like Irish and possibly more generally). Asudeh (2004) generalizes the notion of successive-cyclic unbounded dependencies such that Irish filler-gap and binder-resumptive dependencies involve 'passing' of information in non-base positions and 'grounding' of the information in the base position. However, only filler-gap dependencies are cyclic in the traditional sense of engaging in some syntactic relation in each successive f-structure on the path between the top and base of the dependency. Furthermore, the mechanism for both passing and grounding in filler-gap dependencies is functional equality, whereas the mechanism for both in binder-resumptive dependencies is anaphoric binding. Lastly, it is assumed that these passing and grounding functions are directly lexically associated with the complementizers *aL* and *aN*. The situation is summarized in Table 4.

	Role Relative to Position			
	Not bottom	**Bottom**	**Method**	**Cyclic?**
aL	Passing	Grounding	Functional equality	Yes
aN	Passing	Grounding	Anaphoric binding	No

Table 4: The role of the Irish complementizers *aL* and *aN* in unbounded dependencies

Table 4 predicts four possible combinations of passing and grounding. This is precisely what is observed:

(116) a. [$_{\text{CP}}$ *aL* ... [$_{\text{CP}}$ *aL* ... — ...]]] Core *aL* multi-clause pattern
pass ground

b. [$_{\text{CP}}$ *aN* ... [$_{\text{CP}}$ *aL* ... — ...]]] Pattern 1
pass ground

c. [$_{\text{CP}}$ *aL* ... [$_{\text{CP}}$ *aN* ... *Rpro* ...]]] Pattern 2
pass ground

d. [$_{\text{CP}}$ *aN* ... [$_{\text{CP}}$ *aN* ... *Rpro* ...]]] Pattern 3
pass ground

The core *aN* multi-clause pattern (*aN* ... *go* ... *Rpro*) is actually just an instance of *aN* in its grounding role.

Cann et al. (2005: 158) criticize the approach of Asudeh (2004) for capturing the four passing/grounding possibilities through disjunctive lexical entries for each of *aL* and *aN*. It is not clear what force this criticism has, since their generalizations for the complementizers are implicity stated in terms of conditionals,[11] which are logically equivalent to disjunctions. More generally, any account that captures the empirically attested variant capabilities of the complementizers must somehow encode the facts that a lower *aL* requires a gap, a lower *aN* requires a resumptive, and higher complementizers may be either *aL* or *aN*.

Furthermore, the top-level disjunctions in the lexical entries for *aL* and *aN* in Asudeh (2004) are not necessary features of the analysis. The passing and grounding behaviour of the complementizers can instead be captured with the following single equations:[12]

(117) *aL*, C ...
$$(\uparrow \text{UDF}) = (\uparrow \underset{(\rightarrow \text{UDF}) = (\uparrow \text{UDF})}{\text{CF}^*} \;\; \text{GF})$$

(118) *aN*, C ...
$$(\uparrow \text{UDF})_\sigma = ((\uparrow \text{GF}^* \{ \text{CF} \;\; \text{UDF} \mid \underset{@\text{MR}(\rightarrow)}{[\text{GF} - \text{UDF}]} \})_\sigma \; \text{ANTECEDENT})$$

(119) $\text{CF} \equiv \{ \text{XCOMP} \mid \text{COMP} \}$

(120) $@\text{MR}(f) = \lambda P \lambda y.y : [(\uparrow \text{UDF})_\sigma \multimap ((\uparrow \text{UDF})_\sigma \otimes f_\sigma)] \multimap ((\uparrow \text{UDF})_\sigma \multimap (\uparrow \text{UDF})_\sigma)$

Other details of the complementizers have been left aside, as indicated by the elides. CF in (119) stands for ‘complement function’; any instance of CF is an XCOMP or COMP. The template in (120) is a general template for manager resources. Its argument is the f-structure of the resumptive pronoun. The three mixed chain patterns all result from either the gap or the resumptive being licensed by the appropriate resumptive in its grounding role, with higher complementizers fulfilling their passing roles.

The complementizer *aL* performs its grounding function by identifying a base GF with the UDF at the top of the dependency. The path to the grounding GF is reached by passing through zero or more sentential complement functions (CFs). If no CFs are passed through, then the equation just states that the UDF in the f-structure that *aL* projects to is equated with some GF in the same f-structure. Whenever CF is realized — that is, whenever there is at least one clause separating the top and base of the unbounded dependency — the off-path defining equation adds the information that there is a

[11] They write (Cann et al. 2005: 158): “And finally, there is the challenge of characterising how the two forms interact with each other, so that *aL* following *aN* removes the need for any subsequent resumptive pronoun, whereas *aN* following *aL* apparently introduces that need.” This is equivalent to the statements that ‘if *aL* follows *aN*, no resumptive is required’ and ‘if *aN* follows *aL*, a resumptive is required’.

[12] Asudeh (2004: 157–160, 208) also discusses the necessity for a book-keeping operation called *dependency relabelling* in the entry for *aN*. I leave the details of this operation aside here.

UDF feature in the CF f-structure, such that the value of this UDF is the same as the value of the UDF feature in *aL*'s f-structure.

This in itself does not guarantee the successive-cyclic pattern observed in (111) (i.e. *aL* ... *aL* ... *aL* ... __). It also allows intervening *go* complementizers, as in the unattested pattern **aL* ... *go* ... *go* __. In order to block this pattern, I assume that the lexical entry for *go* includes the following negative constraint:

(121) *go*, C ...
$\neg(\uparrow \text{UDF})$

This constraint specifies that the f-structure of the clause introduced by *go* cannot contain a UDF. This is inconsistent with the UDF passing requirement of a higher *aL* and the unattested pattern therefore does not occur. This assumption is equivalent to the assumption in McCloskey (2002: 203) that *go* is the realization of C that bears neither the Op-feature nor the EPP-feature. In McCloskey's theory, this has the effect that *go* is the realization of a C whose specifier is unfilled, which is equivalent in LFG-theoretic terms to a C whose f-structure contains no UDF.

The passing role of the complementizer *aN* is fulfilled by the realization of equation (118) in which the UDF of *aN*'s f-structure is the antecedent of a (possibly embedded) complement's UDF. Unlike the complementizer *aL*, which fulfills both its grounding and passing functions through functional equality, *aN* fulfills its twin functions through anaphoric binding. This is captured through the feature ANTECEDENT at sem-structure (Dalrymple 1993, Asudeh 2005), hence the σ projections on both sides of the equation in (118). In its grounding role, *aN* states that its UDF is the antecedent of a grammatical function other than UDF (using complementation). This part of the equation is also associated with a manager resource, through the template call @MR(→), where the @MR template is defined as in (120). The manager resource and the feature ANTECEDENT together ensure that the grounding GF is a resumptive pronoun, without requiring any explicit marking of the pronoun as such. The pronoun is just an ordinary pronoun (independent or incorporated). Consumption of the resumptive pronoun by the manager resource resolves the resource surplus and semantic composition in the Glue Semantics is successful. For proofs, see Asudeh (2004: chapter 6).

Finally the initial GF* term allows an unbounded number of unrestricted grammatical functions to be passed through until either the lower UDF (passing case) or the resumptive pronoun (grounding case) is found. This is motivated by the fact that *aN*'s passing and grounding roles use anaphoric binding, which is independently required if the resumptive pronoun is to be treated as an ordinary pronoun. Anaphoric binding is not subject to the same sorts of constraints on extraction as gap-based dependencies. This generates the core *aN* multi-clausal pattern (112), allowing an unbounded number of *go*-marked complements to intervene. Since the passing/grounding equation for *aN* does not successively identify *aN*'s UDF with that of its complement, the requirements of *aN* are consistent with *go*'s requirement that its clause not contain a UDF. Similarly, the equation also allows for *aN*-dependencies to reach through any grammatical function, not just complement functions. This allows for the kind of complex NP extraction observed in pattern 2 (McCloskey 2002: 197–199), as exemplified in (114) above.

9.1.1 Summary

The analysis of Irish explains the behaviour of Irish filler-gap and binder-resumptive dependencies, including complex 'mixed chains'. The key intuition is that both the complementizers *aL* and *aN* contribute to the cyclicity of Irish unbounded dependencies (although only *aL* is strictly successive-cyclic), where the cycles are broken down into a dependency passing and a dependency grounding component. The two complementizers fulfill these roles through separate mechanisms: functional equality for *aL* and anaphoric binding for *aN*. These distinct mechanisms are theoretically motivated by the nature of the base of the dependency (gap versus resumptive) and are empirically motivated by the distinct multi-clause marking patterns of the complementizers.

The key aspect of the analysis, for present purposes, is that the relation between the top of an Irish resumptive unbounded dependency and the pronoun at the base is just one of anaphoric binding and the pronoun is a full pronoun in the syntax (c-structure and f-structure); the resumptive is thus syntactically active. This immediately predicts that the resumptive does not behave like a gap with respect to syntactic phenomena such as islands, weak crossover, reconstruction, across-the-board extraction and parasitic gaps. Furthermore, the resumptive pronoun is lexically a completely ordinary pronoun, so the fact that resumptives have the same form as ordinary pronouns in Irish (an instance of McCloskey's generalization) is immediately explained.

9.2 Vata resumptives[13]

The essential puzzle of Kind 2, syntactically inactive resumptives is that they behave like gaps syntactically, but nevertheless look exactly like other pronouns. The most natural explanation of these facts is that there is no underlying distinction between the resumptives and other pronouns. The tonal marking on Vata pronouns initially seems to offer a challenge, but Koopman and Sportiche (1982) demonstrate that the tonal marking cannot be about resumption per se, because it occurs on non-resumptive pronouns, as observed in section 3.2. These facts are explained by an analysis that grows out of LFG's traceless treatment of unbounded dependencies, based on f-structural token equality, and the restriction operator.

First, let us give a uniform treatment of Vata pronouns, resumptive or otherwise, using ɔ as an example:

(122) ɔ $(\uparrow \textsc{person}) = 3$
$(\uparrow \textsc{number}) = \textsc{sg}$
$(\uparrow \textsc{gender}) = \textsc{masc}$
@PRONOUN
@DEFAULT-TONE
@WH-TONE

The pronoun specifies its agreement features but otherwise invokes a number of generalization templates that are common to all personal pronouns in the language. The pronominal agreement information can also be similarly factorized, but I leave this aside here.

The templates invoked in (122) are defined as follows:

(123) @PRONOUN $(\uparrow \textsc{pred}) = \text{`pro'}$
$(\uparrow_\sigma \textsc{antecedent}) \multimap [(\uparrow_\sigma \textsc{antecedent}) \otimes \uparrow_\sigma]$

(124) @DEFAULT-TONE $\{ (\uparrow_\rho \textsc{tone}) \mid (\uparrow_\rho \textsc{tone} = \textsc{mid-high}) \}$

(125) @WH-TONE $\{ \neg[(\textsc{subj} \uparrow) \wedge (\uparrow_\sigma \textsc{antecedent type}) = \textsc{wh-operator}] \mid$
$(\uparrow_\rho \textsc{tone}) = \textsc{low} \}$

According to (123), the pronoun contributes a standard PRED 'pro' to the syntax at f-structure and contributes a standard pronominal meaning constructor to the semantics. According to (124), the pronoun has to have a TONE specification at phonological-structure. If nothing else specifies the tone, then the value of TONE is MID-HIGH, as in ɔ̍. According to (125), if the pronoun is a subject and is bound by a *wh*-operator, then it must have LOW TONE, overriding the default in (124). This accounts for the otherwise puzzling pattern of data in (31) and (32), repeated here:

[13]An implemented grammar fragment of the Vata analysis below and a small test suite of examples can be found at `http://www.carleton.ca/~asudeh/grammars/`. The grammar runs in XLE; it does not have a Glue Semantics component and therefore only approximates RMTR, as further clarified in the comments in the grammar. The grammar is meant solely as a test of formal claims about abstract syntactic relationships; it uses English as both the object language and the metalanguage and does not attempt to approximate Vata word order or facts of Vata syntax outside a limited fragment of the unbounded dependency system.

(126) àlɔ́$_i$ ɔ̱̀ gūgū nā ɔ̍$_j$ / * ɔ̍$_i$ / ɔ̀$_i$ ní yà la̍
who$_i$ heR$_i$ think that he-ɔ̍$_j$ / * he-ɔ̍$_i$ / he-ɔ̀$_i$ NEG healthy WH
'Who thinks he is sick?'
(Koopman and Sportiche 1982: (15a))

(127) àlɔ́$_i$ ɔ̱̀$_i$ yra̍ ɔ̍$_i$ nɔ́ nā ɔ̱̀$_i$ mlì la̍ (Koopman and Sportiche 1982: (16))
who$_i$ heR tell his$_i$ mother that he$_i$ left WH
'Who told his mother that he left?'

See section 3.2 above for further discussion.

Once again, the specification in (122) is the general lexical specification of ɔ and is in no way specific to the resumptive function. In particular, the pronoun has a PRED feature and a standard pronominal meaning constructor. The PRED feature means that the pronoun cannot be straightforwardly functionally equated with a UDF, because the unique PREDs of the UDF and the pronoun lead to a Consistency violation. The meaning constructor means that the pronoun cannot straightforwardly semantically compose in a proof containing a UDF binder, because it is saturating the scope of the UDF and causing a resource surplus. The resource surplus is once again resolved using a manager resource, which licenses the resumptive. Kind 1, syntactically active resumptives (e.g., Irish) and Kind 2, syntactically inactive resumptives (e.g., Vata) are thus unified to the extent that they both require manager resources in order to be licensed.

The second part of the analysis of Vata requires parametrization of the base of the filler-gap unbounded dependency, using the restriction operator:[14]

(128) $\{\ [\text{GF} - \text{SUBJ}]\ \mid\ \text{SUBJ}\backslash\text{PRED}\ \}$

This does not affect the body of the unbounded dependency function. It just means that the base can be realized as a personal pronoun, because the restriction, \PRED, removes the pronominal information that normally prevents a pronoun from being identified with the top of an unbounded dependency. Since the body is unaffected, this means that the resumptive dependency inherits all island constraints. Lastly, the pronoun is present in c-structure, LFG's representation of surface syntax.

The full dependency equation, with top, body and base represented, is shown in (129). This information would be either associated directly with SpecCP or with a null complementizer, depending on independent theoretical assumptions.

(129)
$$
\begin{array}{l}
(\uparrow \text{UDF})\backslash\text{PRED} = \\
(\uparrow \quad \underset{\textbf{Constraints}}{\text{CF}^*} \quad \left\{ \begin{array}{c} [\text{GF} - \text{SUBJ}] \\ (\rightarrow \text{PRED}) = (\uparrow \text{UDF PRED}) \end{array} \ \middle|\ \begin{array}{c} \text{SUBJ}\backslash\text{PRED} \\ (\uparrow \text{UDF})_\sigma = (\rightarrow_\sigma \text{ANTECEDENT}) \\ @\text{MR}(\rightarrow) \end{array} \right\})
\end{array}
$$

The unbounded nature of the dependency is captured through CF*, the body of the unbounded dependency. The body is associated with appropriate off-path constraints to restrict extraction (islands, etc.), as indicated by '**Constraints**' below CF*. For example, the constraint $\neg(\rightarrow \text{UDF})$ would capture the *wh*-island data discussed in section 3.2, as per the method discussed in section 5.4.2. I leave further details of island constraints aside here. Turning to the top of the dependency, the PRED of the UDF must be restricted out, otherwise functional equality with the restricted subject at the base of the unbounded dependency will not succeed, given the definition of the restriction operator (Kaplan and Wedekind 1993); see section 5.5. However, the UDF and SUBJ are syntactically inserted with

[14]There may be other pronominal information associated with Vata personal pronouns, such as PRONTYPE (Butt et al. 1999), depending on other details of the analysis. These other pronominal features may also be restricted. If PRONTYPE is used for Vata personal pronouns, for example, the restrictions in equations (128) and (129) would be \PRED\PRONTYPE.

Case is also an open issue (if it is specified differentially on the UDF and the pronoun), but could be handled similarly to PRED and PRONTYPE. An analysis of case in terms of restriction is possibly independently motivated by Icelandic control (Andrews 1982).

their full lexical information intact, including PRED. In other words, the SUBJ and UDF both have PREDs, but the restricted functional equality sets these features aside when equating the SUBJ and UDF f-structures. The off-path constraint on non-subject bases states that the lexically specified PRED of the UDF is the PRED of the non-subject GF in all other case. Otherwise the non-subject gap would be identified with a UDF that has its PRED restricted out. This off-path constraint thus entails that a non-subject base is fully identified with the UDF and allows gapped GFs to satisfy general constraints on f-structural well-formedness.

The result of this kind of unbounded dependency relation is that the top of the unbounded dependency, e.g. a *wh*-phrase, must agree with a resumptive pronoun (if the top bears agreement morphology), but it does so by actually being equated with the pronominal f-structure (roughly, the top and the pronominal base unify), since the restriction on the PRED feature prevents any Consistency violation. The f-structure for the simple resumptive example (130) is shown in (131):

(130) àlɔ́ <u>ɔ̀</u> mlì la̍ (Koopman and Sportiche 1982: 14a)
who heR left *wh*
'Who left?'

(131)
$$\left[\begin{array}{ll} \text{PRED} & \text{'leave}\langle\text{SUBJ}\rangle\text{'} \\ \text{UDF} & \left[\begin{array}{ll} \text{PRED} & \text{'pro'} \\ \text{PRONTYPE} & \text{Q} \\ \text{PERSON} & 3 \\ \text{NUMBER} & \text{SG} \\ \text{GENDER} & \text{MASC} \end{array}\right] \\ \text{SUBJ} & \underline{\qquad\qquad} \end{array}\right]$$

F-structure (131) is indistinguishable from what would have resulted if the pronoun were a gap, but no reference is made in the analysis to 'underlying' gaps or alternative derivations with gaps instead of the resumptive.

The resumptive dependency is thus correctly predicted to behave like a filler-gap dependency not just with respect to islands, but also with respect to weak crossover, which in LFG is explained by f-structural configurations (Bresnan 1995, 2001, Dalrymple et al. 2001). Any weak crossover restrictions will be realized as in a filler-gap dependency, because the filler occupies a less-embedded and more-embedded f-structural position. Reconstruction of the filler in the resumptive site is similarly predicted, because the UDF fills two token-identical f-structural values, one of which is the f-structure of the pronoun. Across-the-board extraction and parasitic gaps are similarly predicted to be grammatical, all else being equal (that is, to the extent that independent facts of the grammar permit or license them).

The restriction of PRED on a SUBJ base entails that a gap is ungrammatical, but does not in itself entail that the SUBJ must be a pronoun, as opposed to any other contentful nominal that could independently occur in the position. This solution for this problem ultimately stems from RMTR and forms the point of unification between syntactically active and syntactically inactive resumptives.

Recall that I am assuming a version of LFG based on codescription (see section 5.1). In other words, a single lexical entry contributes semantic information, phonological information, categorial information, and f-structural information. Crucially, these contributions are made independently of each other: the f-structure is not 'interpreted' to obtain semantic information, as it is in the alternative, description by analysis approach. Thus, even if the unbounded dependency equation impacts on some of the syntactic information contributed by the pronoun, the phonological specifications and, most importantly, semantic specifications are left untouched.

The obligatoriness of the resumptive is immediately explained if we assume that Vata resumption is licensed by a manager resource, like Irish. The manager resource is contributed by the SUBJECT base of the unbounded dependency, just as in the equation for Irish *aN* in (118). The manager resource template is the same as the one used for Irish, in (120). A second off-path constraint specifies that the pronoun is bound by the UDF, using the same anaphoric binding mechanism we have already encountered. The pronoun is lexically just an ordinary pronoun, so it contributes a pronominal meaning constructor. The manager resource anaphorically binds the subject (matrix or embedded) and removes its meaning constructor. According to Resource Sensitivity, the manager resource can only be satisfied if it actually finds a pronoun to consume. The end result is that a pronoun must be syntactically inserted as usual — and is therefore present in c-structure, despite its inactivity in f-structure — in order for the meaning constructor of the pronoun to satisfy the manager resource.

9.2.1 Summary

The behaviour of Vata resumptives has been explained in a theory that parametrizes the base of Vata unbounded dependencies, such that a single equation is used for filler-gap and binder-resumptive dependencies. The analysis depends on the LFG restriction operator to allow functional equality to be used as the integration mechanism between the top of the unbounded dependency and even a resumptive base. The pronoun is nevertheless treated underlyingly like a completely ordinary pronoun, maintaining McCloskey's generalization. This in turn means, in terms of RMTR, that the pronoun constitutes a surplus resource for resource-sensitive semantic composition, despite being 'inactive' syntactically at f-structure. The surplus resource is consumed by a manager resource, just as in the analysis of Irish. RMTR therefore provides a semantic point of unification between Irish- and Vata-style resumptives without requiring that Vata resumptives be treated as special pronouns or spelled out traces or undeleted copies or in any other way as distinct from what they appear to be: ordinary pronouns.

10 Predictions of the theory

10.1 General predictions

Resumptives in RMTR, whether syntactically active or inactive, involve direct anaphoric binding of a grammatical function. By direct binding, I mean that the ANTECEDENT is a feature of the semantic structure that is mapped directly from the grammatical function's f-structure. Therefore, the theory predicts that only nominals that can be directly bound can be resumptives. In general, this will be pronominals, but it could also include epithets, depending on how epithets are structured in the language (Aoun et al. 2001).

RMTR also explains why resumptives are interpreted as bound variables (McCloskey 1979, Sells 1984). Grammaticized resumptives of both kinds are removed by manager resources in semantic composition. Well-formedness of the remainder of the proof depends on something else consuming the dependency on the resumptive pronoun, for example an $\langle e, t\rangle$ type, since that dependency can no longer consume the removed pronoun. It is the top of the unbounded dependency that in one way or another consumes the vacated dependency. With respect to the non-resource-management portion of the Glue proof — in terms of semantic composition (i.e., the structure of the rest of the Glue proof) and denotation (i.e., the meaning language side of the Glue logic) — the resumptive pronoun is just like a gap: a bound argument. The resumptive is therefore compositionally interpreted as a bound pronoun.

There are also further semantic consequences of the compositional, type-logical licensing of resumptives by manager resources. First, the manager resource consumes a pronoun by taking as its first argument a pronominal type. Therefore, the manager resource inherits whatever type-theoretic restrictions a resumptive pronoun places on its antecedent, which are the general restrictions of an ordinary pronoun. For example, Sells (1984) argues that pronouns take type e individual antecedents as opposed to type $\langle s, e\rangle$ concept antecedents. Second, if some further inherent constraint is associated with resumptive pronouns – for example, as in Bianchi (2008) proposal that resumptives encode 'singleton specificity', building on Schwarzschild (2002) — then this additional constraint will survive resource management, which only removes the pronominal term and does no 'clean up' other pronominal constraints on f-structure or sem-structure.

10.2 Dual strategies: Lebanese Arabic

We have seen that there are basically two strategies for resumptive-licensing, one which removes the resumptive from semantics but leaves it intact in f-structural syntax (SARs) and one that removes the resumptive from both semantics and f-structural syntax (SIRs). There is no a priori reason why a language could not engage both strategies. Lebanese Arabic is arguably just such a language.

Aoun et al. (2001) note that Lebanese Arabic allows reconstruction at the site of resumption if the resumptive is not in an island, but resumptives in islands do not allow reconstruction.

(132) **No island**

təlmiiz-[a]$_i$	l-kəsleen	ma	baddna	nχabbir	[wala	mʕallme]$_i$	ʔənno	huwwe	zaʕbar	b-l-faħṣ.
student-her	the-bad	NEG	want.1P	tell.1P	no	teacher	that	he	cheated.3SM	in-the-exam

'Her bad student, we don't want to tell any teacher that he cheated on the exam.'
(Aoun et al. 2001: 381, (26b))

(133) **Adjunct island**

* təlmiiz-[a]$_i$	l-kəsleen	ma	ħkiina	maʕ	[wala	mʕallme]$_i$	ʔabl-ma	huwwe	yuuṣal
student-her	the-bad	NEG	talked.1P	with	no	teacher	before	he	arrive.3SM

'Her bad student, we didn't talk to any teacher before he arrived.'
(Aoun et al. 2001: 381, (27b))

These facts are immediately explained if Lebanese Arabic has both resumptive strategies available in its grammar. In an island, only the SARs strategy could be grammatical and this strategy does not allow reconstruction, since the pronoun is syntactically present. Outside an island, either strategy is available and the SIRs strategy allows reconstruction, since the pronoun is syntactically absent. This furthermore means that there is no motivation for an extraneous Last Resort strategy, contra Aoun et al. (2001). The explanation offered here assumes, though, that reconstruction is purely a matter of f-structural equality and that SARs therefore block reconstruction. It is likely that reconstruction effects are substantially more subtle than this; further investigation is required.

11 Conclusion

The Resource Management Theory of Resumption is based on the Resource Sensitivity Hypothesis (natural languages are resource-sensitive) and McCloskey's generalization (resumptive pronouns are ordinary pronouns). RMTR achieves a unification at the syntax–semantics interface of Kind 1, syntactically active resumptives (as found in, e.g., Irish) and Kind 2, syntactically inactive resumptives (as found in, e.g., Vata). Both types of resumptive equally constitute a resource surplus for semantic composition and must be removed for composition to succeed. The element that removes the pronoun (the manager resource) licenses the resumption through removal of the pronoun at the syntax–semantics interface (i.e., in the Glue proof). The relation between the manager resource and the pronoun is established through regular mechanisms of anaphoric binding.

The difference between syntactically inactive resumptives and syntactically active resumptives is that while the latter are only removed at the syntax–semantics interface, the former are removed both at the interface and in the syntax. Therefore, in the syntax SARs act purely like pronominals and therefore behave like pronominals with respect to syntactic diagnostics such as islands and weak

	Lexicon/Morphology	Syntax C-structure	Syntax F-structure	Semantics Interface/Composition	Semantics Type
Kind 1	Ordinary Pronoun	Present	Present (Active)	Removed Compositionally	Ordinary Pronoun
Kind 2	Ordinary Pronoun	Present	Absent (Inactive)	Removed Compositionally	Ordinary Pronoun

Table 5: Properties of grammaticized resumptive pronouns

crossover. In contrast, SIRs are present in the surface (c-structure) syntax, they are absent at the abstract level of syntax that encodes predication and grammatical relations (f-structure). Therefore, SIRs behave like gaps with respect to syntactic diagnostics such as islands and weak crossover. To the extent that reconstruction, ATB extraction and parasitic gaps are purely syntactic diagnostics of gaps, we would expect a similar sharp division between SARs and SARs with respect to these phenomena, too. However, if these phenomena are at least partly licensed at the syntax–semantics interface — in Glue proofs, in terms of the present theory — the generalizations may be more subtle, at least for RMTR, as the two kinds of grammaticized resumptive are essentially indistinguishable at the syntax–semantics interface.

In both cases, though, there is no lexical or featural distinction between resumptive pronouns and ordinary pronouns. To the extent that the theory accounts for resumptive data successfully, McCloskey's generalization is explained: there can be no form distinction between resumptives and other pronouns, because there is in fact only a single set of pronouns which serve a variety of functions. This has the further consequence that resumptive pronouns are expected to behave like other pronouns with respect to any semantic restrictions they place on their antecedents (Doron 1982, Sells 1984, Bianchi 2008). The general picture that emerges is summarized in Table 5.

References

Abney, Steven P. 1987. The English Noun Phrase in its Sentential Aspect. Ph.D. thesis, MIT.

Abramsky, Samson. 1993. Computational Interpretations of Linear Logic. *Theoretical Computer Science* 111: 3–57.

Adger, David. 2008. Bare Resumptives. This volume.

Adger, David, and Gillian Ramchand. 2005. Merge and Move: Wh-Dependencies Revisited. *Linguistic Inquiry* 36(2): 161–193.

Alexopoulou, Theodora, and Frank Keller. 2002. Resumption and Locality: A Crosslinguistic Experimental Study. In Mary Andronis, Erin Debenport, Anne Pycha, and Keiko Yoshimura, eds., *CLS 38: The Main Session*, vol. 1. Chicago, IL: Chicago Linguistic Society.

—. 2003. Linguistic Complexity, Locality and Resumption. In *Proceedings of WCCFL 22*. Somerville, MA: Cascadilla Press.

—. 2007. Locality, Cyclicity, and Resumption: At the Interface between the Grammar and the Human Sentence Processor. *Language* 83(1): 110–160.

Alsina, Alex. 2008. A Theory of Structure-sharing: Focusing on Long-distance Dependencies and Parasitic Gaps. Paper presented at LFG08, Sydney, Australia.

Andrews, Avery. 1982. The Representation of Case in Modern Icelandic. In Bresnan 1982b, 427–503.

—. 1990. Unification and Morphological Blocking. *Natural Language and Linguistic Theory* 8: 507–557.

Aoun, Joseph, Lina Choueiri, and Norbert Hornstein. 2001. Resumption, Movement, and Derivational Economy. *Linguistic Inquiry* 32(3): 371–403.

Asudeh, Ash. 2004. Resumption as Resource Management. Ph.D. thesis, Stanford University.

—. 2005. Relational Nouns, Pronouns, and Resumption. *Linguistics and Philosophy* 28: 375–446.

—. 2006. Direct Compositionality and the Architecture of LFG. In Miriam Butt, Mary Dalrymple, and Tracy Holloway King, eds., *Intelligent Linguistic Architectures: Variations on Themes by Ronald M. Kaplan*, 363–387. Stanford, CA: CSLI Publications.

—. 2009. The Logic of Pronominal Resumption. Ms., Carleton University. In preparation for Oxford University Press.

Asudeh, Ash, and Richard Crouch. 2002. Coordination and Parallelism in Glue Semantics: Integrating Discourse Cohesion and the Element Constraint. In Miriam Butt and Tracy Holloway King, eds., *Proceedings of the LFG02 Conference*, 19–39. Stanford, CA: CSLI Publications.

Asudeh, Ash, and Frank Keller. 2001. Experimental Evidence for a Predication-Based Binding Theory. In Mary Andronis, Chris Ball, Heidi Elston, and Sylvain Neuvel, eds., *CLS 37: The Main Session*, vol. 1, 1–14. Chicago, IL: Chicago Linguistic Society.

Asudeh, Ash, and Ida Toivonen. 2008. Lexical-Functional Grammar. Ms., Carleton University. To appear in Heine and Narrog (To appear).

Benton, Nick, Gavin Bierman, Valeria de Paiva, and Martin Hyland. 1993. A Term Calculus for Intuitionistic Linear Logic. In *Proceedings of the First International Conference on Typed Lambda Calculus*, vol. 664 of *Lecture Notes in Computer Science*, 75–90. Berlin: Springer Verlag.

Bianchi, Valentina. 2008. Some Notes on the 'Specificity Effects' of Optional Resumptive Pronouns. This volume.

Boeckx, Cedric. 2003. *Islands and Chains: Resumption as Derivational Residue*. Amsterdam: John Benjamins.

Borer, Hagit. 1984. Restrictive Relatives in Modern Hebrew. *Natural Language and Linguistic Theory* 3: 219–260.

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

Bresnan, Joan, ed. 1982b. *The Mental Representation of Grammatical Relations*. Cambridge, MA: MIT Press.

Bresnan, Joan. 1995. Linear Order, Syntactic Rank, and Empty Categories: On Weak Crossover. In Dalrymple et al. 1995, 241–274.

—. 2001. *Lexical-Functional Syntax*. Oxford: Blackwell.

Bresnan, Joan, and Sam A. Mchombo. 1987. Topic, Pronoun, and Agreement in Chicheŵa. *Language* 63(4): 741–782.

Butt, Miriam, Tracy Holloway King, María-Eugenia Niño, and Frédérique Segond. 1999. *A Grammar Writer's Cookbook*. Stanford, CA: CSLI Publications.

Cann, Ronnie, Ruth Kempson, and Lutz Marten. 2005. *The Dynamics of Language: An Introduction*. Amsterdam: Elsevier.

Carpenter, Bob. 1997. *Type-Logical Semantics*. Cambridge, MA: MIT Press.

Chomsky, Noam. 1981. *Lectures on Government and Binding*. Dordrecht: Foris.

—. 1982. *Some Concepts and Consequences of the Theory of Government and Binding*. Cambridge, MA: MIT Press.

—. 1986. *Knowledge of Language: Its nature, origin, and use*. New York, NY: Praeger.

—. 1993. A Minimalist Program for Linguistic Theory. In Hale and Keyser 1993, 1–52. Reprinted as chapter 3 of Chomsky (1995).

—. 1995. *The Minimalist Program*. Cambridge, MA: MIT Press.

Crouch, Richard, and Josef van Genabith. 2000. Linear Logic for Linguists. Ms., PARC and Dublin City University. `http://www2.parc.com/istl/members/crouch/`; checked 10/02/2005.

Curry, Haskell B., and Robert Feys. 1958. *Combinatory Logic*, vol. 1. Amsterdam: North-Holland.

—. 1995. The Basic Theory of Functionality. Analogies with Propositional Algebra. In de Groote 1995, 9–13. Reprint of Curry and Feys (1958: Chapter 9, Section E).

Dalrymple, Mary. 1993. *The Syntax of Anaphoric Binding*. Stanford, CA: CSLI Publications.

Dalrymple, Mary, ed. 1999. *Semantics and Syntax in Lexical Functional Grammar: The Resource Logic Approach*. Cambridge, MA: MIT Press.

Dalrymple, Mary. 2001. *Lexical Functional Grammar*. San Diego, CA: Academic Press.

Dalrymple, Mary, Vaneet Gupta, John Lamping, and Vijay Saraswat. 1999a. Relating Resource-Based Semantics to Categorial Semantics. In Dalrymple 1999, 261–280.

Dalrymple, Mary, and Ron Kaplan. 2000. Feature Indeterminacy and Feature Resolution. *Language* 74(4): 759–798.

Dalrymple, Mary, Ronald M. Kaplan, and Tracy Holloway King. 2001. Weak Crossover and the Absence of Traces. In Miriam Butt and Tracy Holloway King, eds., *Proceedings of the LFG01 Conference*, 66–82. Stanford, CA: CSLI Publications.

—. 2004. Linguistic Generalizations over Descriptions. In Miriam Butt and Tracy Holloway King, eds., *Proceedings of the LFG04 Conference*, 199–208. Stanford, CA: CSLI Publications.

Dalrymple, Mary, Ronald M. Kaplan, John T. Maxwell III, and Annie Zaenen, eds. 1995. *Formal Issues in Lexical-Functional Grammar*. Stanford, CA: CSLI Publications.

Dalrymple, Mary, John Lamping, Fernando Pereira, and Vijay Saraswat. 1999b. Overview and Introduction. In Dalrymple 1999, 1–38.

—. 1999c. Quantification, Anaphora, and Intensionality. In Dalrymple 1999, 39–89.

Dalrymple, Mary, John Lamping, and Vijay Saraswat. 1993. LFG Semantics via Constraints. In *Proceedings of the Sixth Meeting of the European ACL*, 97–105. European Chapter of the Association for Computational Linguistics, University of Utrecht.

de Groote, Philippe, ed. 1995. *The Curry-Howard Isomorphism*, vol. 8 of *Cahiers du Centre de Logique*. Louvain-la-neuve, Belgium: Academia.

Doron, Edit. 1982. On the Syntax and Semantics of Resumptive Pronouns. In *Texas Linguistic Forum 19*, 1–48. Austin, TX.

Elbourne, Paul D. 2005. *Situations and Individuals*. Cambridge, MA: MIT Press.

Embick, David, and Rolf Noyer. 2007. Distributed Morphology and the Syntax–Morphology Interface. In Ramchand and Reiss 2007, 289–324.

Engdahl, Elisabet. 1985. Parasitic Gaps, Resumptive Pronouns, and Subject Extractions. *Linguistics* 23: 3–44.

Erteschik-Shir, Nomi. 1992. Resumptive Pronouns in Islands. In Helen Goodluck and Michael Rochemont, eds., *Island Constraints: Theory, Acquisition and Processing*, 89–108. Dordrecht: Kluwer.

Fenstad, Jens Erik, Per-Kristian Halvorsen, and Tore Langhold amd Johan van Benthem. 1987. *Situations, Language and Logic*. Dordrecht: D. Reidel.

Ferreira, Fernanda, and Benjamin Swets. 2005. The production and comprehension of resumptive pronouns in relative clause "island" contexts. In Anne Cutler, ed., *Twenty-first Century Psycholinguistics: Four Cornerstones*, 263–278. Mahway, NJ: Lawrence Erlbaum Associates.

Frege, Gottlob. 1891/1952. Function and Concept. In P. T. Geach and Max Black, eds., *Translations from the Philosophical Writings of Gottlob Frege*, 22–41. London: Blackwell. Translated by P.T. Geach.

Gamut, L.T.F. 1991. *Introduction to Logic*, vol. 1 of *Logic, Language, and Meaning*. Chicago: University of Chicago Press.

Gärtner, Hans-Martin. 1997. Generalized Transformations and Beyond. Ph.D. thesis, University of Frankfurt am Main.

—. 2002. *Generalized Transformations and Beyond: Reflections on Minimalist Syntax*. Berlin: Akademie-Verlag.

Girard, Jean-Yves. 1987. Linear Logic. *Theoretical Computer Science* 50: 1–102.

—. 1989. *Proofs and Types*, vol. 7 of *Cambridge Tracts in Theoretical Computer Science*. Cambridge: Cambridge University Press. Translated and expanded by Yves Lafont and Paul Taylor.

—. 1995. Linear Logic: A Survey. In de Groote 1995, 193–255.

Guilliot, Nicolas. 2008. Reconstructing Resumption. Paper presented at *Resumptive Pronouns at the Interfaces*, University of Paris 7.

Guilliot, Nicolas, and Nouman Malkawi. 2006. When Resumption Determines Reconstruction. In Donald Baumer, David Montero, and Michael Scanlon, eds., *Proceedings of the 25th West Coast Conference on Formal Linguistics*, 168–176. Somerville, MA: Cascadilla Proceedings Project.

—. 2008. Weak vs. Strong Resumption: Covarying differently. This volume.

Hale, Kenneth, and Samuel Jay Keyser, eds. 1993. *The View from Building 20*. Cambridge, MA: MIT Press.

Halle, Morris, and Alec Marantz. 1993. Distributed Morphology and the Pieces of Inflection. In Hale and Keyser 1993, 111–176.

Halvorsen, Per-Kristian. 1983. Semantics for Lexical-Functional Grammar. *Linguistic Inquiry* 14(4): 567–615.

Halvorsen, Per-Kristian, and Ronald M. Kaplan. 1988. Projections and Semantic Description in Lexical-Functional Grammar. In *Proceedings of the International Conference on Fifth Generation Computer Systems*, 1116–1122. Institute for New Generation Systems, Tokyo. Reprinted in Dalrymple et al. (1995: 279–292).

Heim, Irene, and Angelika Kratzer. 1998. *Semantics in Generative Grammar*. Oxford: Blackwell.

Heine, Bernd, and Heiko Narrog, eds. To appear. *The Oxford Handbook of Linguistic Analysis*. Oxford: Oxford University Press.

Howard, William A. 1980. The Formulae-as-Types Notion of Construction. In Jonathan P. Seldin and J. Roger Hindley, eds., *To H.B. Curry: Essays on Combinatory Logic, Lambda Calculus and Formalism*, 479–490. London: Academic press. Circulated in unpublished form from 1969. Reprinted in de Groote (1995: 15–26).

Jacobs, Roderick A., and Peter S. Rosenbaum, eds. 1970. *Readings in English Transformational Grammar*. Waltham, MA: Ginn and Company.

Jacobson, Pauline. 1999. Towards a Variable-Free Semantics. *Linguistics and Philosophy* 22: 117–184.

Jäger, Gerhard. 2005. *Anaphora and Type Logical Grammar*. Dordrecht: Springer.

Johnson, David, and Shalom Lappin. 1999. *Local Constraints Vs. Economy*. Stanford, CA: CSLI Publications.

Johnson, Kyle. 2007. Determiners and Movement. Ms., University of Massachusetts at Amherst. Presented at *On Linguistic Interfaces*, Ulster.

Kaplan, Ronald M. 1987. Three Seductions of Computational Psycholinguistics. In Peter Whitelock, Mary McGee Wood, Harold L. Somers, Rod Johnson, and Paul Bennett, eds., *Linguistic Theory and Computer Applications*, 149–181. London: Academic Press. Reprinted in Dalrymple et al. (1995: 339–367).

—. 1989. The Formal Architecture of Lexical-Functional Grammar. In Chu-Ren Huang and Keh-Jiann Chen, eds., *Proceedings of ROCLING II*, 3–18. Reprinted in Dalrymple et al. (1995: 7–27).

Kaplan, Ronald M., and Joan Bresnan. 1982. Lexical-Functional Grammar: A Formal System for Grammatical Representation. In Bresnan 1982b, 173–281. Reprinted in Dalrymple et al. (1995: 29–135).

Kaplan, Ronald M., and Jürgen Wedekind. 1993. Restriction and Correspondence-Based Translation. In *Proceedings of the 6th Meeting of the EACL*. European Chapter of the Association of Computational Linguistics, University of Utrecht.

Kaplan, Ronald M., and Annie Zaenen. 1989. Long-Distance Dependencies, Constituent Structure, and Functional Uncertainty. In Mark Baltin and Anthony Kroch, eds., *Alternative Conceptions of Phrase Structure*, 17–42. Chicago, IL: University of Chicago Press. Reprinted in Dalrymple et al. (1995: 137–165).

Kehler, Andrew. 2002. *Coherence, Reference, and the Theory of Grammar*. Stanford, CA: CSLI Publications.

King, Tracy Holloway. 1995. *Configuring Topic and Focus in Russian*. Stanford, CA: CSLI Publications.

King, Tracy Holloway, and Annie Zaenen. 2004. F-structures, Information Structure, and Discourse Structure. Talk presented at the Winter School in LFG and Computational Linguistics, University of Canterbury, Christchurch, New Zealand. Extended abstract available online (checked 19/08/2007):
`http://cslipublications.stanford.edu/LFG/9/lfg04kingzaenen-abs.html`.

Kleene, Stephen C. 1956. Representation of Events in Nerve Nets and Finite Automata. In Claude Shannon and John McCarthy, eds., *Automata Studies*, 3–41. Princeton, NJ: Princeton University Press.

Klein, Ewan, and Ivan A. Sag. 1985. Type-Driven Translation. *Linguistics and Philosophy* 8: 163–201.

Kokkonidis, Miltiadis. 2008. First-Order Glue. *Journal of Logic, Language and Information* 17(1): 43–68.

Koopman, Hilda. 1982. Control from COMP and Comparative Syntax. *Linguistic Review* 2(4): 365–391. Reprinted in Koopman (2000: 126–150).

—. 1999. The Internal and External Distribution of Pronominal DPs. In Kyle Johnson and Ian G. Roberts, eds., *Beyond Principles and Parameters Essays in Memory of Osvaldo Jaeggli*, 91–132. Dordrecht: Kluwer. Reprinted in Koopman (2000: 77–118).

—. 2000. *The Syntax of Specifiers and Heads*. London: Routledge.

Koopman, Hilda, and Dominique Sportiche. 1982. Variables and the Bijection Principle. *Linguistic Review* 2(2): 139–160. Reprinted in Koopman (2000: 19–39).

—. 1986. A Note on Long Extraction in Vata and the ECP. *Natural Language and Linguistic Theory* 4(3): 357–374. Reprinted in Koopman (2000: 151–166).

Kratzer, Angelika. 2008. Making a Pronoun: Fake Indexicals as Windows into the Properties of Pronouns. Ms., University of Massachusetts, Amherst. To appear in *Linguistic Inquiry*. Available at semanticsarchive.net; retrieved 13/08/2008.

Lebeaux, David. 1990. Relative Clauses, Licensing, and the Nature of the Derivation. In *Proceedings of the North East Linguistics Society*, 318–332. Amherst, MA: GLSA.

Lev, Iddo. 2007. Packed Computation of Exact Meaning Representations. Ph.D. thesis, Stanford University.

McCloskey, James. 1978. A Fragment of a Grammar of Modern Irish. Ph.D. thesis, University of Texas, Austin.

—. 1979. *Transformational Syntax and Model Theoretic Semantics: A Case-Study in Modern Irish*. Dordrecht: Reidel.

—. 1983. On the Binding of Resumptive Pronouns in Modern Irish. Paper presented at GLOW, University of York.

—. 1990. Resumptive Pronouns, $\overline{\text{A}}$-Binding and Levels of Representation in Irish. In Randall Hendrick, ed., *Syntax of the Modern Celtic languages*, vol. 23 of *Syntax and Semantics*, 199–248. San Diego, CA: Academic Press.

—. 2002. Resumption, Successive Cyclicity, and the Locality of Operations. In Samuel David Epstein and T. Daniel Seeley, eds., *Derivation and Explanation in the Minimalist Program*, 184–226. Oxford: Blackwell.

—. 2006. Resumption. In Martin Everaert and Henk van Riemsdijk, eds., *The Blackwell Companion to Syntax*, 94–117. Oxford: Blackwell.

McCloskey, James, and Kenneth Hale. 1984. On the Syntax of Person-Number Inflection in Modern Irish. *Natural Language and Linguistic Theory* 1: 487–533.

Moortgat, Michael. 1997. Categorial Type Logics. In Johan van Benthem and Alice ter Meulen, eds., *Handbook of Logic and Language*, 93–177. Cambridge, MA: MIT Press. Co-published with Elsevier Science B.V., Amsterdam.

Morrill, Glyn. 1994. *Type Logical Grammar*. Dordrecht: Kluwer.

Pollard, Carl, and Ivan A. Sag. 1992. Anaphors in English and the Scope of Binding Theory. *Linguistic Inquiry* 23(2): 261–303.

—. 1994. *Head-driven Phrase Structure Grammar*. Chicago, IL and Stanford, CA: The University of Chicago Press and CSLI Publications.

Postal, Paul M. 1966. On So-Called Pronouns in English. In Francis P. Dineen, ed., *Report of the 17th Annual Round Table Meeting on Language and Linguistics*. Washington, D.C.: Georgetown University Press. Reprinted in Jacobs and Rosenbaum (1970: 56–82).

Ramchand, Gillian, and Charles Reiss, eds. 2007. *The Oxford Handbook of Linguistic Interfaces*. Oxford: Oxford University Press.

Reinhart, Tanya, and Eric Reuland. 1993. Reflexivity. *Linguistic Inquiry* 24(4): 657–720.

Restall, Greg. 2000. *An Introduction to Substructural Logics*. London: Routledge.

Ross, John R. 1967. Constraints on Variables in Syntax. Ph.D. thesis, MIT.

Rouveret, Alain. 2002. How are Resumptive Pronouns Linked to the Periphery? *Linguistic Variation Yearbook* 2: 123–184.

—. 2008. Phasal Agreement and Reconstruction. In Robert Freidin, Carlos P. Otero, and Maria Luisa Zubizarreta, eds., *Foundational Issues in Linguistic Theory: Essays in Honor of Jean-Roger Vergnaud*, 167–195. Cambridge, MA: MIT Press.

Runner, Jeffrey T., Rachel S. Sussman, and Michael K. Tanenhaus. 2002. Logophors in Possessed Picture Noun Phrases. In Line Mikkelsen and Christopher Potts, eds., *Proceedings of the 21st West Coast Conference on Formal Linguistics*, 401–414. Somerville, MA: Cascadilla Press.

Schwarzschild, Roger. 2002. Singleton Indefinites. *Journal of Semantics* 19(3): 289–314.

Sells, Peter. 1984. Syntax and Semantics of Resumptive Pronouns. Ph.D. thesis, University of Massachusetts, Amherst.

Shan, Chung-Chieh, and Chris Barker. 2006. Explaining Crossover and Superiority as Left-to-Right Evaluation. *Linguistics and Philosophy* 29(1): 91–134.

Sharvit, Yael. 1999. Connectivity in Specificational Sentences. *Natural Language Semantics* 7: 299–339.

Shlonsky, Ur. 1992. Resumptive Pronouns as a Last Resort. *Linguistic Inquiry* 23: 443–468.

Steedman, Mark. 2007. On "The Computation". In Ramchand and Reiss 2007, 575–611.

Sternefeld, Wolfgang. 2001. Semantic vs. Syntactic Reconstruction. In Hans Kamp, Antje Rossdeutscher, and Christian Rohrer, eds., *Linguistic Form and Its Computation*, 145–182. Stanford, CA: CSLI Publications.

Toivonen, Ida. 2003. *Non-Projecting Words: A Case Study of Swedish Verbal Particles*. Dordrecht: Kluwer.

van Dalen, Dirk. 2001. Intuitionistic Logic. In Lou Goble, ed., *The Blackwell Guide to Philosophical Logic*, 224–257. Oxford: Blackwell.

Zaenen, Annie. 1980. Extraction Rules in Icelandic. Ph.D. thesis, Harvard University. Reprinted as Zaenen (1985).

—. 1985. *Extraction Rules in Icelandic*. New York, NY: Garland.

Zaenen, Annie, Elisabet Engdahl, and Joan Maling. 1981. Resumptive Pronouns can be Syntactically Bound. *Linguistic Inquiry* 12: 679–682.