Chapter 1 The modal *need* VP gap (non)anomaly

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1. Basic properties of auxilary need

It is well known in the literature on English syntax that there are two distinct *needs* with typical 'raising verb' properties, one of which selects a bare VP and is an auxiliary—as attested by the canonical NICE properties—and the other of which selects an infinitive and is not.¹ The shared raising properties are exhibited in (1)/(2):

- (1) a. There need $\begin{cases} not \\ n't \end{cases}$ be any bad blood over this, gentlemen.
 - b. I can put up with the bad food and awful drivers, but need it rain so bloody much day after day?
 - c. Robin doesn't think she has to put up with the nonsense she's been faced with, and the truth is that she in fact needn't.
- (2) a. There needs to be a resolution to this impasse.
 - b. It would need to rain for at least a week before the kind of flood hazard you're worrying about become a real danger.
 - c. Robin needs to realize that she's not the only one with a stake in the outcome.

The data in (1) exibit not only the raising signature but also the so-called NICE properties (negation, inversion, contraction and ellipsis) defining the class of auxiliary verbs in English. This behavior contrasts sharply with that of the infinitival-VP-seeking *need* in (2):

- (3) a. *There { needs not need(s)n't } to be a resolution to this impasse.
 b. *Need(s) it to rain for at least a week before things get that danger
 - b. *Need(s) it to rain for at least a week before things get that dangerous?

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 - c. Robin was talking about getting some tutoring in math, and I told her I thought she needs *(to).

Consistent with this behavior is the incompatibility evident between the *need* which selects a bare VP and the *do* auxiliary and the recognized modals, as vs. the cooccurrence of auxiliary *do* and recognized modals with the *need* which takes infinitive VP complements:

$$\begin{array}{ccc} (4) & a. & *You \left\{ \begin{array}{c} don't \\ shouldn't \\ better not \end{array} \right\} \text{ need have talked to Customs about import-} \\ & \text{ing that vase.} \\ b. & You \left\{ \begin{array}{c} don't \\ shouldn't \\ better not \end{array} \right\} \text{ need to have talked to Customs about im-} \\ & \text{porting that vase.} \end{array}$$

The data reveal further that auxliary *need* never appears with person or tense inflection:

(5) She need $\left(* \left\{ \begin{array}{c} s \\ ed \end{array} \right\} \right)$ not worry about the new tax laws.

By the same token, auxiliary *need*, unlike its raising verb counterpart, lacks a gerundive form:

(6) Needing *(to) not be recognized for who she really was, Robin spent most of the day alone in the park.

The proscription of any inflectional distinctions for auxiliary *need*, the lack of a gerundive form, and its positional ordering with respect to other auxiliaries make it clear that the *need* which selects a bare VP is not just an auxiliary but a modal.

2. *Need* as an NPI

But auxiliary *need* leads a double life. As has long been known (see e.g. Hoeksema 1994), it displays, in addition to its identity as a modal, the defining distribution of a negative polarity item:

(7) a. *You need worry about them.

- b. You need not worry about them.
- c. Need you worry about them?

Like other NPIs, auxiliary *need* can appear in polarity scopings which are both locally and distantly licensed. Thus, just as we have the pattern exhibited in (8) and (9)—

-we also have quite unexceptionable examples such as

- (10) a. You needn't worry about things going in that direction just yet.b. I don't think anyone believes we need worry about things going
 - in that direction just yet.
- (11) a. Need we worry about things going in that direction just yet?b. I wonder if anyone thinks we need worry about things going in that direction just yet.

The semantic licensing conditions on NPIs in general are well-known to display a certain amount of variation. One of the major achievements of contemporary semantics was Frans Zwarts' demonstration that over a very wide class of phenomena, the licensing requirements for subclasses of negative polarity items can be framed in terms of how much of the de Morgan equivalence spectrum they satisfy. Ladusaw's (1979) original insight was that occurrence within the scope of a monotone decreasing/downward entailing operator was a necessary condition for the occurrence of an NPI, where, as per Zwarts (1998), a quantified NP corresponds to a monotone decreasing operator iff, for some boolean algebra \mathfrak{B} , the condition in (12) holds: 8 The modal need VP gap (non)anomaly (12) $(\varphi \in [[NP]] \land \psi \subseteq \varphi) \supset \psi \in [[NP]], \text{ with } \varphi, \psi \in \mathfrak{B}.$

Zwarts observed that the condition in (12) can be proved to be formal equivalences to each of the two conditions a. and b. in (13)i, where \mathcal{O} in all cases in (13) is an operator applying the characteristic function of the property set denoted by the quantified NP. Each of these implications represents half of one of the two de Morgan equivalences respectively. Formally stronger negative operators are created by adding the further implications that ultimately yield the full de Morgan equivalences, as per (13)ii and (13)iii:

(13) i. weak (simple downward entailment):
a.
$$\mathscr{O}(\varphi \lor \psi) \supset \mathscr{O}(\varphi) \land \mathscr{O}(\psi)$$

 $- \mathscr{O}(\varphi) \lor \mathscr{O}(\psi) \supset \mathscr{O}(\varphi \land \psi)$

ii. strong (anti-additive/downward entailment plus closure under finite unions):

$$(13)\mathbf{i} + \mathscr{O}(\boldsymbol{\varphi}) \land \mathscr{O}(\boldsymbol{\psi}) \supset \mathscr{O}(\boldsymbol{\varphi} \lor \boldsymbol{\psi}) = \begin{cases} \mathscr{O}(\boldsymbol{\varphi} \lor \boldsymbol{\psi}) \equiv \mathscr{O}(\boldsymbol{\varphi}) \land \mathscr{O}(\boldsymbol{\psi}) \\ \mathscr{O}(\boldsymbol{\varphi}) \lor \mathscr{O}(\boldsymbol{\psi}) \supset \mathscr{O}(\boldsymbol{\varphi} \land \boldsymbol{\psi}) \end{cases}$$

iii. superstrong (anti-morphic/downward entailment plus completeness & consistency over B):

$$\left\{ \begin{array}{c} \mathscr{O}(\varphi \lor \psi) \equiv \mathscr{O}(\varphi) \land \mathscr{O}(\psi) \\ \mathscr{O}(\overline{\varphi}) = \overline{\mathscr{O}(\varphi)} \end{array} \right\} = (13) \mathrm{ii} + \mathscr{O}(\varphi \land \psi) \supset \mathscr{O}(\varphi) \lor \mathscr{O}(\psi) \\ = \left\{ \begin{array}{c} \mathscr{O}(\varphi \lor \psi) \equiv \mathscr{O}(\varphi) \land \mathscr{O}(\psi) \\ \mathscr{O}(\varphi \land \psi) \equiv \mathscr{O}(\varphi) \lor \mathscr{O}(\psi) \end{array} \right\}$$

The anti-morphic condition, representing full de Morgan compliance, is represented in the English lexicon exclusively by the negator *not* and neg-contracted forms of the auxiliaries.

In terms of the entailment context hierarchy commonly assumed within Zwarts' elaboration of Ladusaw's framework, with simple downward entailment at the bottom and anti-morphic contexts at the top, *need* appears to belong among the weakest NPIs; its licensors include, for example, the very same *at most n* which fails to license the NPIs *yet* or *lift a finger*:

(14) a. At most five people here need worry about the new policy.

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\begin{array}{c} The \ modal \ need \ anomaly \quad 9\\ \text{b. *At most five people } \left\{ \begin{array}{c} \text{have been here yet}\\ \text{will lift a finger to help us} \end{array} \right\}. \end{array}
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As NPI items go, therefore, *need* appears to be among the least demanding.

3. The modal *need* anomaly

Something very odd emerges about this NPI auxiliary verb, however, when we compare the interaction of its polarity and auxiliary properties under local and nonlocal monotone-decreasing scope side by side, illustrated in (15):

- (15) a. I don't think we need worry about things getting unpleasant.
 - b. Terry says we should worry about things getting unpleasant, but I suspect we needn't (worry about things getting unpleasant).
 - c. *Terry says we should worry about things getting unpleasant, but I don't think we need.

(15)a again illustrates the nonlocal licensing of auxiliary/NPI *need*; (15)b shows that auxiliary *need* supports ellipsis in a manner parallel to other auxiliaries, and to no other class of verbs. Given these manifestations of normal NPI and auxiliary patterning, the big surprise is (15)c: in a context where NPI/auxiliary *need* has been shown in (15)a to be possible, the ellipsis behavior documented in (15)b and previous examples is nonetheless proscribed. The only difference between (15)b and (15)c is the location of the element contributing negative scope, the contracted negative n't, in a separate clause from *need*—a situation which otherwise has no effect on the legality of *need*'s occurrence, as attested in (15)a. What (15) shows is that while licensing by a wide-scoping negative operator is possible for *need*, such operators must actually be instantiated in a syntactically highly local environment for ellipsis to be well-formed. The behavior exhibited in (15) is altogether representative:

(16) \dots but I $\left\{ \begin{array}{c} \text{doubt} \\ \text{wouldn't imagine} \\ \text{don't suppose} \end{array} \right\}$ that the Winstons need worry too much about the increase in airfares.

The pattern exhibited in these examples suggests an altogether unexpected entanglement of auxiliary and NPI properties, such that the ellipsis 'prerogatives' belonging to the former are cancelled by the 'wrong' licensing modes

associated with the latter. This impression of entanglement is reinforced by the behavior of modal *need* with respect to the auxiliary-stranding relative clause (ASRC) phenomenon studied in detail in Arnold & Borsley (2010), and exhibited in (17), under the heading of ellipsis:

- (17) a. If we go to Paris, which I'm sure we will __, I want to visit the Cluny.
 - b. When I raise the matter with Robin, which I expect to <u>before</u> too long, I want you in the same room as a witness.

We examine Arnold and Borsley's analysis of the ASRC construction below; I assume with them that this phenomenon is best analyzed as a combination of filler/gap mismatch and the ellipsis properties of auxiliaries verbs. They argue persuasively that such extraction instantiates a filler/gap mismatch which is parasitic, so to speak, on the ordinary ellipsis properties of auxiliaries and is, like ellipsis, restricted to auxiliaries exclusively. Again, the behavior of modal *need* in this construction is consistent with its behavior in more straightforward versions of ellipsis:

- (18) a. If you want to worry about this, which I think you needn't, go right ahead.
 - b. *If you want to worry about this, which I don't think you need, go right ahead.

A still wider class of data shows that this anomaly extends beyond negation contexts to a contrast between local vs. non-local interrogative licensing, where normally permitted ellipsis is blocked in the latter. This dependence of ellipsis on the strict locality of the NPI trigger is, so far as I know, an unprecedented sort of effect.

4. Syntactic conditions on need ellipsis

In principle, the source of the *need* anomaly might involve some semantic difficulty with licensing the ellipsed version of modal *need*. But there seems no obvious way to attack the 'entanglement' problem semantically, in view of clear minimal pairs such as (19):

- (19) a. I think you needn't (worry about this).
 - b. I don't think you need *(worry about this)

Sailer (2006) provides a detailed treatment of neg-raising using the Lexical Resource Semantics (LRS) formalism, including a convincing defense of the origins of the 'raised' negation, such as that exhibited in (19)—and in long-distance NPI licensing generally—in the matrix clause, with the negative interpretation in the embedded clause arising as a result of semantic compositional principles which give negation valents access 'downward' over the complement clause of the neg-raising verb.² Sailer's analysis correctly predicts parallel interpretations for the examples in (19) corresponding to (20):

(20) think'(I)'($\neg \Box$ (you')(worry about this)')

But of the two sentences in (19) which are identical with respect to the truth conditional representation in (20) of their respective meanings, only the first permits ellipsis. There is simply no semantic hook from which to hang the difference in ellipsis eligibility reflected by (19), and more generally, by *need*'s possibilities for ellipsis across the board. It is difficult to avoid the conclusion that the crucial difference is nothing other than the syntactic position of the NPI licensor.

This result is in line with recent work by Richter and Söhn (2007), which defends the claim that 'the main dimensions of lexical variation of German NPIs are, (1) the required minimal strength of a (negative) licenser, (2) the syntactic locality domain in which the licenser must occur, and (3) additional collocational restrictions which may concern extraction, lexical collocates, or scope intervention conditions.' They note a variety of idiosyncratic restrictions on NPI distribution in syntactic configurations, with auch nur 'not even' topicalizable only in embedded clauses, whereas Hehl 'secret', a component of the collocational NPI ein Hehl aus etwas machen 'make a secret of something', is freely topicalizable beyond the root clause, and where, as they report, some topicalizable NPI components are restricted to short topicalization, while others are displaceable over arbitrary syntactic distances. They further allude to cases discussed by van der Wouden in which NPIs are only licensed by negation outside their local syntactic environment, and which thus contrast strikingly with more normal situations in which NPIs require clause-internal licensing. The open question at the moment, of course, is the precise form such syntactic conditions on need should take, requiring us to broaden the range of constructions under scrutiny beyond ellipsis.

The plot thickens: the extraction/ellipsis parallelism 5.

Consider now the data in (21):

(21) a.	We need	not worry	about	this
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- b.
- But worry about this, I think we $\begin{cases} need NOT \\ needn't \end{cases}$ *But worry about this, I don't think we need_. c.

This paradigm manifests precisely the same pattern as (15) and (18), but the difference in this case is that we have, not ellipsis, but normal VP topicalization. What at first looked like an entanglement of auxiliary status and NPI status thus appears to hinge on a distinction between-putting it informally-

happens when it does not. As it happens, this distinction is part of the native architecture of Headdriven Phrase Structure Grammar (HPSG), where the need which does not take a canonical VP[bare] complement and the need which does constitute different lexical signs. The former can be characterized in various ways, depending on how one views SLASH termination. But suppose, for concreteness, that we say that the lexical entry for need which appears in both kinds of ellipsis as well as VP topicalization has the partial description in (22) (temporarily ignoring negation possibilities):

what happens to need when it appears with an VP complement valent and what

(22)
$$\begin{bmatrix} PHON & \langle need \rangle \\ SS|LOCAL|CAT|COMPS & \left\langle \left(\begin{bmatrix} gap-ss \\ HEAD & verb \\ COMPS & elist \end{bmatrix} \right), \dots \right\rangle \end{bmatrix}$$

containing a COMPS specification definable as a list of at most one gap-ss object, whereas instances of *need* with a canonical synsem object complement instantiate a separate lexical entry:

(23)
$$\begin{bmatrix} PHON & \langle need \rangle \\ SS|LOCAL|CAT|COMPS & \langle \begin{bmatrix} canonical-ss & \\ HEAD & verb \\ COMPS & elist \end{bmatrix}, \dots \end{pmatrix} \end{bmatrix}$$

The plot thickens: the extraction/ellipsis parallelism 13

There are precedents for positing distinct lexical items which select for a gap or 'missing' category, the most familiar probably being assure, as in (24), first observed in Kayne (1984) and discussed extensively in Postal (1993):

- (24)Robin is someone who I can assure you to be the best in the a. business.
 - b. *I can assure you Robin to be the best in the business.
 - I can assure you that Robin is the best in the business. c.

Against this background, the *need* anomaly can be reduced to the fact that lexical signs instantiating the entry for need in (23) are licensed under a syntactically far more restrictive condition than those corresponding to (24). The negative polarity operator licensing the first must not only be (super)strong, but must occur within the minimal clause containing this *need*—a fact which, in view of the latter's status as a modal, seriously restricts the possible structural locations that this licensor can occupy.

But in spite of this severe syntactic locality requirement on gap-seeking need, there is also an evident semantic factor implicated in the behavior of this NPI, for while non-gap-seeking modal need, as noted above, is among the most tolerant of NPIs, requiring as it does nothing more than a monotonedecreasing operator for its licensing, gap-seeking need in contrast has a unique status among the set of NPIs in Zwarts' inventory: as already observed, apart from (local) interrogative inversion contexts, only the superstrong negation trigger not seems to license it. For example, hardly and scarcely, both weak NPI licensors, cannot license it:

(25) You
$$\begin{cases} a. hardly \\ b. scarcely \\ c. never \\ shouldn't think). \end{cases}$$
 need *(worry about the testimony of a confessed perjuror, I

Still stronger negation triggers, such as never and no one, also fail to license gap-seeking *need*:

- (26)a. *If Robin files an affadivit about her back taxes (which none of the other people there need), she should be all right.
 - b. *If somebody calls Leslie back, which no one need, don't let him talk you into doing him any favors.
 - *??If you think we should worry about Robin's comments, which I myself think we $\begin{cases} need r \\ never \end{cases}$ c.

All three of the polarity triggers in (26) have anti-additive but not anti-morphic properties; thus

- (27) a. None of the people there sings and dances $\not\supset$ None of the people there sings and none of the people there dances.
 - b. No one sings and dances. $\not\supset$ No one sings and no one dances.
 - c. I've never sung and danced. $\not\supset$ I've never sung and I've never danced.

Never is somewhat surprising in this respect, since it appears to do nothing more than generalize the denotation of *not* over all intervals. Such data contrast markedly with the behavior of *one bit*, which Zwarts erroneously identifies as an English NPI which requires superstrong licensing, i.e., via *not*; the fact is that very few if any native speakers of English find anything even mildly anomalous about any of the following:

(28)
$$\left\{\begin{array}{c} \text{None of the people there} \\ \text{No one I talked to} \\ \text{I've never} \end{array}\right\}$$
 appreciated Robin's sarcasm one bit.

There are abundant Google hits for clauses exhibiting licensings of *one* bit with all of these licensors, and several others besides (e.g., *Neither of us/Neither Robin nor Leslie liked it one bit*). It follows that for what is probably the vast majority of native English speakers, *one bit* is only a strong NPI (note **At most three people like Robin's paintings one bit*), and Zwarts proposes no other instances from English as candidates for superstrong status. I suggest, based on the judgments reflected in the foregoing data sets, that gap-seeking modal *need* might qualify for that status, however. The issue isn't completely straightforward—the problem may have to do with the configurational position of the licensor; much depends on how *never* is treated structurally, but the possibility is certainly worth considering.³ If *never* proves to have access to the same structural locations as *not*, we can maintain the generalization in (29):

- (29) 1. Modal *need* which selects a complement VP must appear within the semantic scope of a monotone-decreasing operator.
 - ii. Modal *need* which does not select a complement VP must be locally licensed under a superstrong operator.⁴

As per the LRS treatment of NPI licensing surveyed in Richter & Söhn (2007), both syntactic and semantic specifications of the licensing environment are imposed by the collocations which NPIs comprise.

There is a highly suggestive psycholinguistic aspect to the restriction summarized in (29). A series of important experiments described in Richter and Radó (to appear) reveals, inter alia, that 'weak NPIs in neg-raising constructions are significantly worse under an anti-additive licenser than they are when licensed by a merely downward-entailing licenser in the same clause' and that '[s]trong NPIs are not as good as good in neg-raising constructions as weak NPIs' (pp. 14–15). There appears to be a correlation, that is, between the relative strength of the NPI and the degree of locality required of the licenser to make the appearance of the NPI completely acceptable. On the one hand, the effect of a more powerful class of licensers (anti-additive) is more than offset in the case of weak NPIs by reduced locality in the position of that licensor, relative to a less powerful licenser which is structurally more proximate, while on the other, strong NPIs-those which require anti-additive licensorsare distinctly less acceptable when their licensor is syntactically distant than when it is local. As already noted, gap-seeking modal need is in all likelihood the most highly constrained NPI in English, in that it is a true superstrong item, requiring nothing less than overt negation via not. Given the correlation suggested by Richter and Radó's work, we would indeed expect just this effect: the strongest NPI in English should indeed require the most structurally proximate licensing condition, and, as illustred in the preceding discussion, that is exactly what we find. Richter and Radó's suggestion that NPI licensing may represent a gradient, rather than a categorical, effect, and that syntactic factors may play a key role in determining the form of this gradient, may thus turn out to be highly relevant to the rather striking correspondence between the unique superstrong status of gap-seeking modal need on the one hand and the severely local syntactic licensing it requires on the other.

The phenomena reviewed in this presentation thus strongly suggest that the pseudoentanglement of auxiliary and NPI licensing conditions presented by modal *need* emerges as an unproblematic by-product of the interaction between, on the one hand, syntactic conditions on NPI licensing of the sort discussed in detail in Richter & Söhn (2007), and on the other, a distinction between lexical heads seeking normal constituent complements, vs. gapselecting (versions of those) heads on the other. This distinction—native to

HPSG's mechanism for licensing gaps— coupled with the conditions stated in (29), provides a natural and in a sense routine basis for the behavior of gapseekng *need*, but one seemingly inaccessible to approaches which take overtly saturated heads to be the same lexical items respectively as their gap-hosting counterparts.

6. Syntactic conditions on gap-seeking *need*: some consequences

On the assumption that the foregoing analysis of the version of modal *need* which seeks a gaps is correct, a number of suggestive consequences follow illustrating the utility of modal *need's* behavior as a diagnostic tool bearing on certain foundational issues of syntactic representation.

6.1. Auxiliary-stranding relative clauses via VP sluicing: contraindications

6.1.1. Phonological sluicing: an alternative analysis of ASRC?

The first 'application' of the distributional pattern identified in what I've already said about modal *need* in effect returns the favor to Arnold and Borsley's specific analysis of the ASRC effect by showing that an alternative which they did *not* consider in their paper, involving a kind of sluicing analysis implemented via phonological deletion, is not a credible alternative to the analysis they propose. The alternatives to the solution proposed in Arnold and Borsley's analysis that they themselves survey either assume that *which* is a pro-VP, or that it is a proform for an NP complement head which selects a clause containing a SLASH VP specification; in both cases, the gap is an actual VP gap. The authors show that these alternatives are untenable, and that the gap is far better treated as an actual NP gap corresponding to the nominal *wh*proform *which*. But there is a fourth possibility, not considered in their paper, which presents an ostensibly more serious challenge to their favored analysis.

To set the stage for this discussion, we need to consider in some detail (30), representing Arnold and Borsley's solution to the ASRC pattern.

Here the value of SLASH corresponds to a *wh* pronoun whose index is an event type, and where—crucially—an empty SLASH value corresponds to the case of ordinary auxiliary ellipsis.⁵ The key point of (30) is that auxiliaries have the option of 'cashing out' an NP SLASH bearing an event/situation index, which will, as per (30), be identical to that of the nominal *which* filler, and therefore semantically identical to the VP antecedent of the ASRC. On this analysis, there are two lexical entries for each auxiliary, one corresponding to the normal case with an overt nonfinite VP complement, and the other corresponding to the constraint in (30), whereby an auxiliary head supports either ordinary ellipsis (when SLASH is empty) or the pattern in ASRCs, which require that the SLASH specification on the auxiliary's ARG-ST VP element terminate a filler/gap pathway marked by SLASH which is ultimately associated with a *wh* NP filler. (18)a is completely expected on the basis of the well-formedness of (15)b, while (18)b is ruled out for whatever reasons prove to be responsible for blocking standard ellipsis in cases like (15)c:

(18)

- a. If you want to worry about this, which I think you needn't, go right ahead.
- b. *If you want to worry about this, which I don't think you need, go right ahead.

If the value of SLASH is not *eset*, the SLASH value on the auxiliary partially described in (30) will be, by the SLASH Amalgamation mechanism introduced in Bouma et al. (2001), identical in the relevant ways to the *which* filler, allowing the SLASH path to terminate legally. Given the specific restrictions on modal *need* in (29), only versions of this lexeme in which (a form of) *not* appears on its COMPS list can appear. If the entry is the sole source of ASRCs, then

(30)

there will be no question of ill-formed VP fronting via pied-piping, or—on the assumption that the optional argument in (30) is confined to auxiliaries of a similar construction implicating [AUX –] verbs with VP complements. But the conclusion that Arnold and Borsley reach in their analysis does not take into account data such as (31)–(32) suggesting a kind of extraction-plusellipsis phenomenon available to auxiliary complements, one which cannot be handled by (30) as it stands:

- (31) a. I told Robin that I'd rather discuss this with Leslie, who I didn't know, than with Kim, who I did __.
 - b. I might buy THIS supercar, but THAT one, I definitely wouldn't
- (32) a. There are a lot of cars I wouldn't buy, but there's $one_i which_i I$ definitely WOULD ___.
 - b. There are a lot of cars I wouldn't buy, and then there's the McLaren $F1_i$, which_iI definitely WOULD ____.

The fronted constituent in such examples has an index corresponding not to a VP meaning, but to that of a normal referring expression. There is a filler and, in the absence of any reason to believe otherwise, a SLASH pathway whose topmost element is the clausal sister of the filler, but which terminates in a gap following an auxiliary element. In order to allow this pathway to terminate legally, we might assume that there is an inaudible constituent syntactically available to 'absorb' the associated SLASH specification, yielding a trace. Suppose that a normal filler/gap pathway in cases such as (31) and (32) exists, but that there is in addition an analogue of ordinary sluicing which applies to VP complements of auxiliaries:

(33) ... than with Kim_i , $who_i I \operatorname{did} \frac{know}{know} t_i$.

This approach, appealing to some mechanism of dephonation, has the apparent advantage of requiring minimal revision to the standard, widely supported HPSG mechanism of filler/gap connectivity. Moreover, its dephonation process could in princple be linked to the mechanism for handling noncanonical coordinations of various kinds defended in an HPSG context in Beavers & Sag (2004), Chaves (2007), and Chaves (2008), where multiple syntactic objects are mapped to a unitary phonetic representations under the pheno/tectogrammar architecture first proposed for HPSG in Reape (1993, 1996), yielding what appears as a deletion of all but one of these objects. I Syntactic conditions on gap-seeking need: some consequences 19

will refer to constructions such as (31)b and (32) under a phenogrammar deletion treatment as instances of sluiced extraction environments (SEEs), and the treatment summarized as (33) could plausibly be extended to handle the ASRC phenomenon. On the other hand, were we to assume a unitary analysis of extraction in missing-VP syntactic environments while maintaining the solution provided in Arnold & Borsley (2010), phenomena such as (31)–(32) would require a very different treatment from what has been suggested for ASRCs.⁶

6.1.2. Sluicing: a nonsolution for ASRCs

An ellipsis mechanism might be assumed to account for (34)a along the lines suggested in (34)b:

- (34) a. If we go to the Cluny, which I hope we will, we can see the Unicorn tapestries.
 - b. If we go to $[_{NP}$ the Cluny $]_i$, which $_i$ I hope we will go to t_i , we can see the Unicorn tapestries.

But this particular version of ellipsis would not account itself for, e.g., the following item of corpus data:

(35) Lately I've been feeling kind of melancholy that I've never been with another girl, and if I marry her (which I want to, eventually) I never will, and I feel I'm missing out.[attested at http://www.scarleteen. com/cgi-bin/forum/ultimatebb.cgi?ubb=get_topic;f=3;t= 010083;p=1]

It is obvious that a sluicing analysis confined to the effect in (34) cannot account for (35), since there will be no sluicible context in the representation of (35) to which the extracted *which* in this example can be linked, if we assume that the syntactic representation in the latter is parallel to (34)b. However, the representation in (36) would be possible on this approach:

(36) a. ... and if I [marry her]_j, which_j I want to do t_j , eventually... b. ... and if I [marry her]_j, which I want to $\frac{do}{dt} t_j$,...

Such an analysis could in fact be extended to all cases of the ASRC phenomenon, via a dedicated phonological rule of nonauxiliary do suppression

when, in HPSG terms, the latter takes a *gap-ss* nominal complement. On this rather simple, unitary approach, we would reanalyze (34)b as

(37) If we [VP] go to the Cluny $]_i$, which $_i$ I hope we will $\frac{do}{do} t_i$, we can see the Unicorn tapestries.

It will be useful at this point to underscore the key differences between the Arnold & Borsley (2010) solution, on the one hand, and the sluicing proposal on the other. In the former, there are two lexical entries for auxiliaries, one which seeks an overt VP valent and one which does not, whereas on the latter, there is only a single version of each auxiliary entry, along with an optional dephonation of nonauxiliary *do*. The appeal of the latter treatment is that the three seemingly separate ellipsis types illustrated in (38) might then all be handled by a single, general condition along the lines of (39):

- (38) a. Robin should read that book, and you should [VP read that book] too.
 - b. If Robin reads that book, which_{*i*} she should $[VP do] t_i$, she'll get a better idea of what's involved.
 - c. I don't read most books on that subject, but there's one (which_i) I definitely should [VP read] t_i .
- (39) Optional Auxiliary Complement Dephonation: the PHON specification of a VP complement to a [AUX +] head is *elist* in the DOM list of the VP headed by that auxiliary.

This approach takes VP ellipsis to be a strictly phonetic effect, and its apparent simplicity seems too good to be true. I believe that that impression can be shown to be correct, based on properties of NPI *need* already discussed which can be used to tease apart the consequences of the sluicing and mismatch analyses respectively for the ASRC construction.

Consider the syntactic structure shown in (40)b that the approach in (38)–(39) mandates for (40)a:

- (40) a. *If you choose to worry about them, which I don't think you need, it's *your* (misguided) choice.
 - b. If you choose to $[VP worry about them]_i$, which *i* I don't think you need do t_i , it's *your* misguided choice.

Syntactic conditions on gap-seeking need: some consequences 21 Why would (40)a. be ill-formed, on this account? The assumption implicit in the SEE account is that the syntactic structures involved in the ASRC construction are identical to those of VPs with an overt nonauxiliary *do*. But the latter are perfectly well-formed in contexts parallel to (40)b:

(41) If you choose to worry about them, which I don't think you *need* do, it's *your* (misguided) choice.

It follows that the ellipsis solution rests on a hidden assumption that the licensing conditions on NPI *need* refer to not just syntactic but *phonological* conditions as well. Specifically, the dephonation proposal for ASRC phenomena requires an appropropriate negation trigger to be locally present just in case some portion of *need*'s VP complement is prosodically null. In order to account for all the cases in (38), then, we need something, in addition to (39), along the following lines:

(42) Modal *need* must appear with a phonetically realized VP complement in situ if its licensing negation trigger is realized non-locally.

This constraint achieves a level of unnaturalness which suggests that it is very unlikely to be correct. The bottom line, then, is that in order to maintain the sluicing analysis of ASRCs, the best one could do would be to craft an extremely ad hoc condition tailored precisely to the very fine-grained conditions necessary to rule out (40)b and (21)c. In constrast, on the Arnold/Borsley analysis, where the lexical entry for *need* in the former is completely separate from that in the latter, there is nothing further to explain: (40)a is inevitably bad, because the locality conditions on gap-seeking *need* are not met.⁷

6.1.3. Further implications for ellipsis

There is one particularly clear message carried by the distribution of modal *need* which deserves to be stressed, in view of current debates about the relationship between analytic conclusions and psycholinguistic metrics for assessing those conclusions. We have seen that elliptical constructions support non-locally licensed modal *need* iff the *need* involved is the version which seeks a full VP. These facts present a strong contraindication to analyses of VP ellipsis which posit covert syntactic structure at the ellipsis gap cite; as a corollary, they cast doubt on the support for such analyses based on psycholinguistic experiments, e.g., those reported in Runner and Snider (2011) to the effect

that their eye-tracking studies 'strongly [support] a model in which linguistic structure—including fine-grained phonological and semantic information—is present in the ellipsis site, and is consistent with a PF-deletion analysis for VP ellipsis'. As the previous discussion makes clear, however, the covert (as vs. missing) VP representation of VP ellipsis analysis defended by Snider and Runner entails the bizarre licensing condition on modal *need*, essentially given in (42). The *need* facts actually suggest an inversion of the methodological storyline of Snider & Runner (2011): whereas Snider and Runner frame their analysis as the application of a particular technological probe to determine the relative adequacy of alternative treatments of ellipsis, the unequivocal superiority of the 'missing VP' treatment of ellipsis in predicting the distribution of modal *need* shows that the properties of this NPI in ellipsis contexts mandate a critical assessment of how reliable eye-tracking results are as probes for syntactic structure.⁸.

6.2. Inverse licensing: consequences for the analysis of gaps

Apart from the analysis of ellipsis, the behavior of modal *need* has nontrivial implications for the copy-and-(phonological) deletion analysis of filler/gap connectivity, and presents a kind of benchmark to which theories of extraction can be usefully subjected. We start with the observation that *need* can be inversely licensed, as in (43):

(43) You need worry about (being defeated by) no one, at this point.

This possibility, while not elsewhere unknown, represents somewhat unusual behavior for NPIs, at least in my own variety of English:

- (44) a. I won't ever worry about anyone.b. *I will ever worry about no one.
- (45) a. I haven't yet heard from anyone. b.??*I have yet heard from no one.

Consider now the data in (46), in relation to (48):

- (46) a. If prudence demands that we discuss this with at most one other person, then we WILL discuss this with at most one other person.
 - b. If prudence demands that we discuss this with at most one other person, then discuss this with at most one other person we will.

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(47) If YOU mention this to at most two other people, as (I promise) I will, then we should be reasonably secure.

These examples are at least comfortably acceptable for most speakers, and completely unexceptionable for many. Compare their status with that of the examples in (48):

- (48) a. You need talk to only/at most one other person.
 - b. *... and talk to only/at most one other person, you need __.
 - c. *If you talk to at most one other person, as I can assure you you need, we should be reasonably secure.

On the assumption that filler/gap linkage is created by an application of a transformational rule which replicates an entire phrasal substructure in some left peripheral position in a tree and subsequently suppresses its phonetic output, (48), we should have a structure expressible as in (49):



All structural requirements on the licensing of *need* are met—yet the example is blatently ill-formed. More generally, as this example shows, the presence of a local superstrong licensor for gap-licensing *need* is never in question, on the copy/dephonation extraction analysis; in this respect, the problems faced by the latter as a general theory of extraction are quite comparable to those of the VP-sluicing treatment of the ASRC data and strictly phonological accounts of VP ellipsis. To accomodate this discrepancy between the syntactic structure and the predicted outcome, there seems no alternative to imposing, by one kind of fiat or another, some condition on the in situ version of the dephonated copy of the negative VP complement which deprives it of the ability to create the negative scope which it enjoys as an overt VP in a non-extraction context.

In marked contrast, given the proposal I've advanced earlier, the associated representation *predicts* the ill-formedness of the ill-formed example (48)b:



The *need* which selects the *gap-ss* VP complement requires a local superstrong licensor, but there is none available in the clause headed by this need. Need therefore fails to be licensed in (50). Similar observations apply to multidominancebased treatments of extraction (see e.g. Vicente 2009), where both a node in the specifier position and an 'in situ' node dominate the same lexical content, and where, again, the result of VP topicalization yields a structure corresponding to an ill-formed result for the class of data exemplified in (21)c and (48)c. On the assumption that there are two distinct entries for modal/NPI need, one of which is a weak NPI in Zwarts' sense and the other of which requires a locally realized superstrong negation trigger as licensor, all of the data cited above fall out with essentially no additional cost. Thus, the proposal offered in Arnold & Borsley (2010), appropriately extended, appears to be favored by general methodological considerations of parsimony and comprehensiveness as the preferred solution to the pseudo-anomaly in the distribution of modal need, and consequently offers strong support for a treatment of both extraction and ellipsis in terms of empty or missing categories, rather than any of the other alternative approaches surveyed above.

Notes

- 1. An early version of this paper was presented to the 2009 meeting of the CoBaiISE symposium (Constraint-based Linguistics in the Southeast of England) I thank the CoBaLiSE organizers, Doug Arnold and Bob Borsley, for inviting me to participate and to the symposium participants for their interest and feedback. I also wish to express my gratitude to Regine Eckhardt and Manfred Sailer, organizers of the 2010 NPI workshop at the University of Göttingen, for inviting me as a plenary speaker, to Eva Csipak and Mingya Liu for their organizational assistance in connection with the conference and this volume, and the members of the workshop for their encouragement and very helpful comments. My work on the problems posed by modal/NPI *need* owes a great deal not only to the research results of Doug Arnold, Bob Borsley, Frank Richter and Manfred Sailer, but also to many enjoyable and provocative discussions with them about the phenomena discussed below over the past several years. Finally, I thank the two referees for this volume chapter, whose perceptive comments materially enhanced the content and presentation of this material. All shortcomings are mine alone.
- 2. The difference between neg-raising verbs such as think, on the one hand, and claim, on the other, can be comprehensively captured, as Sailer shows, by the difference in the lexical entries provided for the two verbs-in particular, the use of the IN(TERNAL) C(ONTENT) specification for *think* which preserves the denotation of this verb's complement as the material which any negation associated with thinks must scope over. Thus, in e.g. Robin does not think Leslie will attend, not must take scope over the INC specification of the VP headed by think, but this scope does not necessarily include think itself. The straightforward simplicity of Sailer's LRS treatment in capturing such strictly lexically based narrow scoping of nonquantificatory predicates is, so far as I know, unique amongst underspecified semantic frameworks with deferred determination of quantifier scoping; in contrast, Copestake et al. (2006), for example, explicitly emphasize (p. 304) that such non-structurally driven 'internal' scoping is not provided for in their MRS treatment of the syntax/semantics interface. A certain caution is called for here, however, in view of the fact that MRS is not a formally explicit interface between structural representations and interpretation, but rather an uninterpreted markup language in which logical variables ('indices') and quantifier names are intermixed in formulæ of the description language with record structure attributes, in a manner largely parallel to the mid-1980s P& P level of 'Logical Form'. It is therefore not clear just what actual semantic interpretations are (not) available on the basis of any given MRS CONTENT specification.
- 3. The ambiguity of You could never do that, which parallels the familiar case of You could not do that, suggests that, like not in the detailed treatments of negation in Kim & Sag (1995, 2002), never can appear either as a complement of a higher auxiliary or as a left-side adjunct modifier in the VP selected by such an auxiliary. We should note, at the same time, that a sentence such as Robin would never believe we'd gotten instructions from Leslie does not seem to have a reading which entails that Robin believed we'd never gotten instructions from Leslie, merely that, on any occasion where it was proposed that we'd received such instructions, Robin would have disputed that suggestion, suggesting that never cannot scope widely, and therefore, unlike not, fails to appear as an auxiliary complement. The most immediate question for our purposes, however, is the status of examples such as Robin might do something like that but I would NEVER/Robin might do

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something like that but I *would never*, whose acceptability bears strongly on the question of whether *never* can correspond to a valent of *would*.

- 4. A referee for this paper makes the interesting suggestion that gap-seeking *need* might not be superstrong, but rather be specified as requiring the negator *not* on its COMPS list. Such a proposal is worth pursuing, but there is an evident difficulty that it faces, viz., the licensing of this *need* under interrogative inversion: *We could, of course, spend all our time worrying about getting audited, but* need *we*? Interrogative contexts license even the strongest NPIs in English, apart from *need* (*Should we be one bit worried about getting audited, when we've had the best accounting firm in the world preparing our corporate tax returns for more than fifty years*?), and clearly the still stronger conditions required to license gap seeking *need* include this possibility. The acceptable uninverted, uncontracted appearances of gap-seeking *need* require *not* on their COMPS lists; the point is that inverted forms do not, and it is difficult to see how to subsume both obligatorily local *not* and obligatorily local interrogative inversion under a unitary valence-based solution, though the possibility deserves consideration.
- 5. In (30), *neg* corresponds to either the formative *not* or its contracted variant n't; I believe that neg-contracted auxiliaries are actually different lexical items than their non-negated counterparts, but this point is irrelevant in terms of the issues under discussion. Arnold and Sag's discussion assumes the overall framework of Bouma et al. (2001), including the constraints imposed in the latter source on the relationship between ARG-ST on the one hand and valence features on the other, and the lexical schema in (30) reflects that assumption.
- 6. The linearization-based ellipsis (LBE) approach alluded to can, I think, be shown to be fundamentally inadequate and empirically untenbable as soon as the range of data it confronts goes beyond the very simplest range of cases. See Levine (2011) for a critical overview of the extensive evidence base that LBE fails to account for. These considerations play no role in the logic of the argumentation bearing on the SEE proposal.
- 7. Coordinations such as (i)-(ii) are immediately problematic for the ellipsis condition in (42):
 - i. In my opinion, we need never mention this matter to the Central Committee and hence we will never mention this matter to the Central Committee.
 - ii. In my opinion, we need—and hence we *will*—never mention this matter to the Central Committee.

The negation trigger here is *never*, which, as we have seen, is not strong enough to license gap-seeking *need* or, as per the hypothesis under examination, *need* with a dephonated VP complement. Moreover, while the overt VP complement to modal *need* here is not realized in the clause in which *need* occurs, the result is still good even though the (inadequate) licensing trigger is not locally to that clause. But according to (42), the RNRed VP must appear syntactically in situ in order to license modal *need*—a possibility made available in the treatment of RNR assumed, for example in Beavers & Sag (2004) and subsequent work pursuing the LBE analysis, but undermined by the empirical failings of that analysis, as documented (in part) in Levine (2011), as noted in footnote 6. So-called multidominance proposals for RNR typically framed in terms of P& P assumptions, suffer from the lack of formal rigor and specificity endemic to this particular framework, and offer no explicit and plausible account of symmetric predicates in RNRed constituents, e.g., *Robin was whistling and Leslie was humming the same tune*; in particular Any such proposal,

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moreover, would have to provide define locality consistent with applicable constraints and conditions which appeal to this crucial notion. At this point, nothing remotely resembling such a precise characterization of multidominance, or locality within the context of a genuine theory of multidominance, is available, and in my view, therefore, any invocation of a multidominance 'escape hatch' in the current context would be too speculative to shed any light on the problem. These RNR examples are, in addition, direct challenges to any extraction-based treatments of RNR and other peripheral ellipsis phenomena, since, again, the locality conditions on gap-seeking *need* are clearly violated in such approaches. The problem any syntactic framework must address in explaining (ii) above is the formulation of a treatment for RNR in which there is a natural characterization of locality in terms of which the shared remnant in RNR falls together with simple cases of *not* complementation; no adequate account of RNR, so far as I am aware, is currently available in any explicitly formulated theory of syntactic representation.

8. This conclusion echoes the caveats adduced in Phillips & Parker (2011) on legitimate inferences about theoretical analysis based on experimental results.

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