Nonmanuals, semantic operators, domain marking, and the solution to two outstanding puzzles in ASL

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This paper provides an analysis of certain nonmanuals from a semantic perspective with respect to the different types of semantic operators they are associated with. The categories of operators include simple/monadic and tripartite/dyadic. This semantic analysis will explain different phonological spreading among upper face/head nonmanuals: negative headshake, brow lowering, and structurally varied use of brow raise. Negative headshake and [+wh]-question brow lowering spread over their c-command domain. However, brow raise does not spread over its c-command domain, and its spreading domain is harder to characterize. The operator analysis provides a coherent explanation for the spreading domain. This distinction underlies a new analysis of the derived sign understand’, and helps resolve two puzzling issues related to its use: (1) why it has brow raise; and (2) what position it occupies in CP. This solution offers additional evidence in support of the claim that ASL has the spec,CP on the left.

Keywords: semantic operators, tripartite, spreading domain, c-command domain, spec,CP

1. Introduction

1.1 Objectives

The main objective of this paper is to provide an analysis of certain nonmanuals in view of their semantic function, in particular with respect to the different types of semantic operators they are associated with. The relevant categories of operators that will be discussed are simple/monadic and tripartite/dyadic. The semantic analysis will be used to explain different phonological spreading domains among upper face/head nonmanuals, primarily the negative headshake, the [+wh]-question brow lowering, and the structurally varied brow raise. When they spread,
the negative headshake and \([+\text{wh}]-\)question brow lowering spread over syntactic material contained in their c-command domain. In contrast, brow raise does not spread over its c-command domain, and its spreading domain is much harder to characterize by syntactic, phonological, prosodic, or morphological criteria. The semantic operator analysis provides a coherent explanation for the spreading domain. Once the presence and spreading domains are established, it is expected that these nonmanual markings (NMMs), like others, will integrate prosodically with the manual signs within the constructions in which they appear (Wilbur 2009).

I then apply the distinction among these NMMs to offer a new analysis of the historically derived sign labeled \textit{understand}' where the prime distinguishes it from the regular verb \textit{understand} (Fischer & Lillo-Martin 1990). As a result, I will be able to resolve two puzzling issues related to its use in American Sign Language (ASL): (1) why it has brow raise on it; and (2) what position it occupies in CP. Because this sign has been suggested as a counterexample to the general consensus that the complementizer head C is on the right in ASL, my analysis provides a response to this objection.\(^1\) I can also use this solution to offer additional evidence in support of the claim that ASL has the specifier of CP on the left, not on the right as Neidle et al. (2000) have claimed.\(^2,3\)

\(^1\) The notion that the head C is on the right in ASL is widely agreed on by sign language researchers. This paper will deal with one possible counterexample. This then leaves the theoretical issue of having a head on the right. Following Kayne (1994), all heads should be on the left for all phrases for all languages, and deviations from this generalization would have to result from leftward-only movement. To my knowledge, none of the ASL syntacticians have strictly adopted this approach. Instead, I follow Abels and Neeleman (2006) who argued that the same structural configurations can be obtained by allowing ‘symmetrical merge’ — the idea that the head and complement can be merged with the head on either the right or the left. This approach eliminates ‘roll-up remnant movement’ while still maintaining leftward-only movement.

\(^2\) The focus in this paper on spec,CP and, in passing, spec,DP, as positions associated with the restrictions of tripartite/dyadic operators (following e.g., Partee 1995) is not to preclude expanded CP phrases — ForceP, TopicP, FocusP, FiniteP, and possibly more as suggested in the cartographic approach (Rizzi 1997; Poletto 2000). What is relevant here is that the specifier hosts material that is in the restriction of a semantically restrictive operator as elaborated by Partee, among others. The ability of spec,DP to host such material shows that the position need not even be above TP in the CP layer. Thus, unless otherwise indicated, spec,CP refers to any specifier above TP, which accumulating evidence supports putting on the left (Abner 2010; Churng 2009; Watson 2010). Abner (2010) provides explicit derivations of \([+\text{wh}]-\)phrase on the right by showing that it involves semantically justified clefting with movement of \([+\text{wh}]-\)phrase to spec,ForceP and IP movement to spec,TopP, both of these specifiers being on the left. (However, Aboh and Pfau (2011) argue that \([+\text{wh}]-\)words do not have interrogative force and therefore would not be in ForceP but FocusP). With a CP that can be bracketed above and below by separate FocusPs, Churng (2009) uses similar movement of IP to the left specifier of the FocP above CP for double-\textit{wh} questions. Thus, \textit{you eat what why?} is derived with \textit{why} going to the
1.2 Argumentation

An outline of the argument is as follows: Various analyses have been proposed to account for the presence of different NMMs. It is well established that brow raise does not spread over its c-command domain (Wilbur & Patschke 1999), whereas negative headshake and [+wh] brow lowering do (Pfau 2002; Pfau & Quer 2002, 2007; Neidle et al. 2000). Pfau and Quer (2002, 2007) distinguish cross-linguistic differences in the behavior of negative headshake, observing that in ASL it is syntactic whereas in Catalan and German Sign Languages it is morphological. However, analyses that address ASL upper face nonmanuals, that is, brow and head positions, have argued them to be purely syntactic (Neidle et al. 2000) or primarily intonational/prosodic (Sandler & Lillo-Martin 2006; Sandler 2011; Dachkovsky 2008). These accounts have not addressed the prosodic/phonological difference in the spreading domain.

I connect the spreading domain difference to the semantic distinction in the type of operator associated with the presence of each NMM. As Szabolcsi (2001) notes, it is a “well-known fact that different quantifier types have different scope-taking abilities”. That is, I attribute the presence of the NMM to an associated semantic operator, and the difference in spreading domain to whether the operator is monadic (takes a simple scope) or dyadic (has a restriction separate from the main/nuclear scope). The spreading domain of NMMs associated with monadic operators is the c-command domain (this has been argued for ASL, and is suggested here for investigation in other SLs). The spreading domain for dyadic operators is the semantic restriction. I argue that brow raise is associated with the restrictive portion of dyadic operators, and hence account for why it does not spread over its left specifier of the FocP under CP, what going to the left specifier of CP, and the IP [you eat t] moving to the left specifier of FocP above CP. Thus, for data which appears to support Neidle et al.’s spec,CP on the right, alternative analyses are not only available but they also provide explanations for additional data, such as multiple [+wh]s, the behavior of sentence-final ‘right side’) [+wh]-phrases as semantically exhaustive, having a non-null presupposition, and the like.

3. My argument is not against the possible existence of right-edge specifiers, such as argued for by Cecchetto, Geraci and Zucchi (2009) for Italian Sign Language (Lingua Italiana dei Segni, LIS), but against it being on the right for ASL. Alba (2010) further argues that wh-questions in Catalan Sign Language (Llengua de Signes Catalana, LSC) show that C and spec,CP in that language are on the right, but she also argues with the wh-dependency marking analysis offered by Cecchetto et al. It would be interesting to see if LIS or LSC display a behavior similar to ASL with differences in spreading domain related to operator type, or even if the operators in the dyadic category all have the same NMM as ASL does with ‘br’. Lillo-Martin and Quadros (2010) raise a similar question and argue on the basis of data from ASL and Brazilian Sign Language (Língua de Sinais Brasileira, LSB) against Cecchetto et al’s claim that sign languages as a group mark wh-dependencies with NMMs rather than standard spec-head or c-command relations.
c-command domain. The NMM will be hosted by a NMM feature in the operator-associated phrase head and will spread over the operator restriction in the specifier by spec-head agreement.4

Once this distinction is made, it can be applied to the analysis of UNDERSTAND′ which is derived from the verb UNDERSTAND. Fischer and Lillo-Martin (1990) discuss the particular case of UNDERSTAND′ from UNDERSTAND, and compare it to others, such as WRONG′ from WRONG; SUPPOSE′ from SUPPOSE; FINISH′ from FINISH. They argue that UNDERSTAND′ is a subordinating conjunction and show that it occurs at the beginning of the clause it introduces, but may be preceded by the sign BUT in the fixed order BUT UNDERSTAND′. Unlike other constituents marked with brow raise, which occur in the left periphery of the initial clause in an ASL sentence (except for non-initial relative clauses), UNDERSTAND′ occurs at the beginning of the second clause. Given these observations, Susan Fischer (p.c.) suggests that UNDERSTAND′ is located in a left side C, and might be evidence against having C on the right in ASL. The two questions that need to be addressed are where this sign sits and why it has brow raise on it. I argue that it has brow raise because it is also the restriction of a dyadic operator and show that the brow raise does not spread over its c-command domain, supporting the analysis. Then, given its behavior parallel to other dyadic operator structures with brow raise, I argue that UNDERSTAND′ is in spec,CP (again, see footnote 2) of the second clause. It gets brow raise by spec-head agreement with the second clause head C. The syntactic tree that will be supported by the current analysis is shown in Figure 1.

Figure 1. Tree for ASL with spec,CP (or various expansions) on left and C on right

4. I should mention here that data from other published sources that are presented here have in every case been corroborated with our consultants, and that our accumulated corpus includes over 60 ASL signers above the age of 18. All of that data has been digitized but much of the older data was glossed by hand and available only on paper. A fully glossed and coded ELAN database of 15 ASL signers sponsored by NIH will be made available in mid-2011.
1.3 Structure of paper

In Section 2, I discuss the theoretical background with a review of previous treatments of the relevant NMMs and introduce the two categories of operators. In Section 3, I discuss the behavior of headshake in negation and brow lowering in [+wh]-questions, which are each associated with a monadic semantic operator. In Section 4.1, I turn to brow raise, which is associated with the restriction of dyadic semantic operators, accounting for its occurrence on a variety of syntactic structures. In Section 4.2, I apply the analysis to understand and explain how the pieces of the puzzle fit together.

2. Theoretical background: Nonmanuals and operators

2.1 Previous accounts for nonmanuals

It has been argued that ASL upper face nonmanuals (brow, head) are purely syntactic (Neidle et al. 2000) or primarily intonational/prosodic (Sandler & Lillo-Martin 2006; see review in Pfau & Quer 2010). While the intonational/prosodic approach is consistent with the idea of NMMs being layered across multiple simultaneous domains (e.g., mouth adverb on VP marked inside of larger interrogative clause; Liddell 1978; Wilbur 2000), it does not consistently address the question of the source of the markers nor the difference in spreading domain. Similarly, the syntactic approach, while suggesting syntax as the source, does not explain the difference in spreading domain.5

In an effort to account for this difference, Pfau (2005, 2006) offers a (partial) syntactic explanation for the spread of NMMs. He divides the syntactic tree into three parts, the lexical (lowest) level, the inner functional level (up to NegP), and the outer functional level (expanded CP) and suggests different NMM/sign interactions at each level. At the lexical level, NMMs undergo prosodic linking, in which the NMM associated with a specific sign may spread to adjacent/functional materials. At the inner functional level, NMMs are associated with morphological features/affixes and spread either to the associated head, or over a prosodic domain (but this latter is not easily determined). Similarly, at the outer functional layer, there are syntactic features that associate with NMMs, and the spreading is either “locally (in spec-head relation) or over the c-command domain of the respective feature”.

With respect to the same spreading issue, Quer (2005) considers a semantic/syntactic distinction, between D-quantification (restrictive) and A-quantification (adverbiai). In the same vein, an earlier study, Wilbur and Patschke (1999), argued that brow raise (‘br’) marks the presence of [−wh] restrictive operators and spreads only over the operator restriction, which sits in the specifier (an early formulation of Pfau’s observation), whereas brow lowering (‘bl’) spreads over the c-command domain of the [+wh] operator, which is not a restrictive operator.6

More recently, Churng (2009, this volume) investigates brow lowering on [+wh]-signs in ASL. She finds a three-way semantic-syntactic-prosodic distinction in brow behavior on sequences of multiple [+wh]-signs at the end of wh-questions (e.g., YOU EAT WHAT WHY?). There are two prosodic characteristics that can be used to mark these distinctions, pause and resetting of the brow position. In one of the possibilities, the two [+wh]-signs are both part of a single focus — there is no pause or resetting between the two signs, signaling one prosodic unit — What did you eat and why did you eat it? In a second possibility, there is a pause but no brow resetting between them, indicating two prosodic units and two focus phrases — What did you eat and why did you eat (at all)? The lack of brow resetting in this case is consistent with the prosodic integration of NMM as argued in Wilbur (2009). Finally, there is both a pause and brow resetting when the second [+wh]-sign is focused (pair list interpretation) — What i,j,k did you eat and why did you eat it i,j,k? As Churng observes, the response to this latter question would be something like I ate watermelon for the water content, rice for the carbohydrates, and a banana for the potassium. The recognition of these additional cues — pauses, brow resets — helps to tease apart structures that might otherwise appear to be the same. Since these have not been systematically attended to before, caution on interpreting existing claims about NMM behavior is needed.

In addition to these lessons on NMMs, there is additional relevance of Churng’s analysis to the present paper, namely the syntactic derivation she proposes. Churng shows that data which appear to support Neidle et al.’s spec,CP on the right are in fact derived by multiple leftward movements. The structure she considers YOU EAT WHAT WHY? has two wh-signs at the end (‘right side’). Churng argues that this results from WHY moving to the left specifier of the FocP under CP, WHAT moving to the left specifier of CP, and the IP [YOU EAT t] moving to the left specifier of FocP above CP.7 What strengthens Churng’s analysis over Neidle et

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6. Recent work by Weast (2008) re-examines brow position and provides evidence to separate affective from grammatical function for both brow positions.

al.'s is that she can relate it to the semantic distinctions discussed above and to the different prosodic phrasing and cues that are associated with the NMM features in each head. Like Neidle et al., she assumes that NMMs are prosodic cues in relation to lexical entries and their syntactic domains, movement is feature driven, and NMMs are features of functional heads. The analysis to be presented here argues that the 'presence' of NMM features and their 'spreading domains' are semantically determined insofar as the operators involved represent different operator types. Again, once their presence and spreading domains are accounted for, they are integrated into the syntax and prosody as expected (see Selkirk 2004 and Potts 2005 for discussion of syntax-prosody interaction in speech, and Wilbur 2009 for ASL).

2.2 Monadic and dyadic operators

The notion of semantic operators derives in part from the postulation of event variables in formal semantics to capture the difference between individuals and events (Davidson 1967); these event variables were argued to be bound by adverbs of quantification. Further work on quantification has established the important role that different types of operators play in semantic interpretation (Montague 1973; Barwise & Cooper 1981; Lewis 1975; Heim 1982; Partee 1991; Diesing 1992; inter alia).

Simple, or monadic, operators apply to a single argument and, functionally speaking, return a result. For example, negation is an operator that changes the polarity of the content inside its scope (that is, positive to negative: A \rightarrow \neg A). Negation is a simple monadic operator in the sense that it takes one constituent (A) and negates it (\neg A). This semantic function is independent of how negation is coded in a specific language. For discussion here, we will represent the operator as a feature ([+neg]) in the head of the Neg Phrase. This operator takes scope over all the constituents in its c-command domain. For clarity, we will represent the NMM 'negative headshake' associated with [+neg] as ([neg hs]).

Similarly, wh-operators [+wh] are monadic. Generally, [+wh]-operators focus a set of individuals (who(m) for people, what for inanimates, where for places, when for times, etc) from which an identification or specification needs to be made. The NMM associated with [+wh]-operators in ASL is brow lowering (‘+bl’), which, like ‘+neg hs’, may spread over the c-command domain of the operator. An issue that will arise in discussion of both [+neg] and [+wh] is the status of the NMM

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8. As Veinberg & Wilbur (1990) have shown, negation can be present without negative headshake, thus other NMM features are involved but are not further discussed in this paper.

9. Weast (2008) has shown clearly that brow lowering is the consistent marker of [+wh]-operators and not brow furrow.
feature, that is, whether it is lexically specified by the negative or [+wh]-sign (for example, can occur on just that sign or must spread over the whole c-command domain), or independently located in the relevant head. For example, if ‘+bl’ is associated with the lexical sign what; does the location and spread of brow lowering change if what is fronted or in situ?

Dyadic operators differ from monadic operators in that they are generally recognized as ‘restricting’ the domain in which a variable may be interpreted. Krifka et al. (1995: 24) describe dyadic operators as relations that “relate two semantic constituents to each other”. These two constituents can be events, situations, variable-containing conditions, among others. Consider (1).

(1) X and (then) Y. e.g., I eat and then go to school. All we know about the relationship between X and Y is that Y comes after X. We do not know if X must happen in order for Y to happen, or if X happening ensures that Y will happen. Compare with (2).

(2) If X, (then) Y. e.g., If it rains tomorrow, the picnic is cancelled. With the presence of the conditional operator, we now know that Y (cancel the picnic) is dependent on the conditions in X (it rains tomorrow) being met. We can also infer that if not X (it doesn’t rain), then not Y (‘not cancel the picnic’). Critically for our purposes, the expression if it rains tomorrow, the picnic is cancelled does not cancel the picnic. The two semantic constituents being related are X and Y; the dyadic operator is the conditional. The ‘restriction’ of the conditional is X, the conditions that must be met in order for Y to occur. Y is traditionally referred to syntactically as the main/matrix clause or semantically as the ‘nuclear scope’. Thus a dyadic operator has the semantic structure in (3), with our example in (4).

(3) Operator [Restriction] [Nuclear Scope]  
(4) IF [X=it rains] [Y= the picnic is cancelled]

This tripartite semantic analysis — the operator, restrictor, and matrix/nuclear scope — occurs in a wide variety of structures: Topic, left dislocation, conditionals (cf. Lewis 1975), yes/no question, focus by preposing (topicalization, wh-cleft, quantifiers, clefting), restrictive relativization, generics (Carlson & Pelletier 1995), focus associates (Rooth 1985), and subjects of individual level predicates and predicate NPs (Chierchia 1995), among others. For convenience, I have dubbed

10. Partee has numerous publications considering parallels between operator structure and discourse structure (Partee 1991, 1992, 1995). For example, she suggests that a possibly more basic alternative to Diesing’s (1992) Mapping Hypothesis (VP material is mapped into the nuclear scope; IP material is mapped into the restrictive clause) might be the Topic-Focus
them \([-wh]\), intending to exclude negation as well as \([+wh]\)-operators, in part because in ASL they all occur with brow raise ‘+br’. The widespread distribution of these \([-wh]\) operators results from the fact that they are semantically unselective quantifiers that can bind free variables in the restriction, e.g., the condition that it rains tomorrow is true. Syntactic tradition identifies spec,CP and spec,DP as the locations of constituents that are associated (semantically, the restrictions) with the presence of operators; these specifiers can be filled overtly (by movement if necessary), or by covert movement at LF (the interface of syntax and semantics). Again, the features representing these operators are in the heads of the relevant phrases.

3. Monadic operators in ASL

3.1 Negation and monadic operators

I begin with the NMM ‘negative headshake’ (henceforth, ‘neg hs’), which has been addressed generally by Zeshan (2006) and by Pfau (2002) and Pfau & Quer (2002, 2007) for ASL, Catalan Sign Language (Llengua de Signes Catalana, LSC), and German Sign Language (Deutsche Gebärdensprache, DGS).\(^{11}\) Pfau & Quer demonstrate that the behavior of ‘neg hs’ is syntactic in ASL but morphological in LSC and DGS.\(^{12}\) In LSC, ‘neg hs’ may attach to just the negative sign (5a) or the verb sign alone if there is no negative sign (5b). In DGS, ‘neg hs’ may not attach to only the negative sign (6a is ungrammatical) but can attach to the verb sign alone if there is no negative sign (6b). These examples reflect the morphological affix status of negative headshake in LSC and DGS. In contrast, in ASL (examples from Neidle et al. 2000), ‘neg hs’ can occur either on a negative manual sign alone (7a), or else must spread over the whole c-command domain ((7b) shows that lack of

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11. We deal only with sentential negation here.

12. ‘neg hs’ is syntactic in ASL only to the extent that it spreads across its c-command domain; that is, its prosodic domain is co-extensive with its syntactic domain. Similarly, ‘neg hs’ in LSC and DGS is morphological in that it behaves like an affix, requiring lexical material that it can attach to. Nonetheless, for all three languages the presence of ‘neg hs’ is directly related to the presence of [+neg], which is present as a semantic operator. Thus, I would say that ‘neg hs’ is associated with [+neg] which resides in the head Neg and projects NegP.
spreading is ungrammatical; (7c) shows the grammatical structure with ‘neg hs’ spreading).  

(5) LSC: ‘Santi does not eat meat.’

a. SANTI [NegP [VP CARN MENJAR] [Neg NO]]

Santi meat eat not

b. SANTI [NegP [VP CARN tV] [Neg [V MENJAR]]]

Santi meat eat-neg

(6) DGS: ‘Mother does not buy flowers.’

a. *MUTTER [NegP [VP BLUME KAUF] [Neg +neg] [specNegP NICHT]]

mother flower buy not

b. MUTTER [NegP [VP BLUME tV] [Neg [V KAUF] [specNegP NICHT]]]

mother flower buy-neg not

(7) ASL: ‘John does not buy a house.’

a. JOHN [NegP [Neg NOT] [VP BUY HOUSE]]

b. *JOHN [NegP [Neg +neg] [VP BUY HOUSE]]

c. JOHN [NegP [Neg +neg] [VP BUY HOUSE]]

In both LSC and DGS, the VP is head final, leaving the verb and negation adjacent to each other. This adjacency may be the factor that encouraged the development of affixal negation, making it easy for the negative to hook to the verb. Despite this similarity, in LSC if the negative sign NO is present, the verb MENJAR and its object CARN ‘eat meat’ do not receive ‘neg hs’, because the feature is satisfied to affix to NO. If NO is not present, the ‘neg hs’, as an affix, needs phonological material to host it, and the Verb moves to the Neg head, where it receives ‘neg hs’. In contrast, in DGS, there is no sign that resides in the Neg head, thus the Verb must always move there to host ‘neg hs’. Separately, the negative sign NICHT, which is lexically specified for having its own ‘neg hs’, occurs in spec,NegP, where it stays despite the movement of the verb KAUF to the Neg head. This leads to a sequence of two signs covered by

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13. Hrastinski (2010) has shown that Croatian Sign Language (Hrvatski Znakovni Jezik, HZJ), which has the same tree that I argue for in ASL, has pre-verbal negation like ASL, and that ‘neg hs’ spreads across its c-command domain, again like ASL.
'neg hs' (at normal and fast signing rates, phonological adjacency leads to one long NMM; Wilbur 2009).

By comparison, the head of NegP in ASL can be filled by the negative sign not and 'neg hs' can occur on this sign alone, or it can spread over the whole scope of negation (the VP buy house), which is the c-command domain of the Neg head. If there is no manual sign in the head of NegP, then the headshake must spread over the whole VP ((7c) is acceptable but (7b) is not).14

3.2 [+wh] — Another simple/monadic operator

The function of a [+wh]-operator in interrogatives (wh-questions) is to focus content information about a referent: who/whom for animates, what for inanimates, when for times, why for reasons, which for identification of a member of a set (e.g., which TV did he buy?). As Aboh and Pfau (2011) reiterate, [+wh]-words do not have interrogative force — that is accomplished by the interrogative/force operator. Thus, [+wh] is a monadic operator like Neg, taking only one constituent (the focused content) as its argument.15 The locations of [+wh] in the syntactic tree are limited. [+wh]-words and phrases that occur in their original positions are ‘in situ’, and in some languages, that is the only option for them. In ASL, the [+wh]-constituent may occur ‘in situ’, initially, finally, or both (doubled) (Churng 2009; Watson 2010).16

14. There are other negative options (e.g., ‘focused neg’ on the right with brow raise on everything before it; Wilbur & Patschke 1999) but they are not necessary to the line of argumentation.

15. It is possible for [+neg] and [+wh] to occur more than once in a sentence, but this is beyond the purview of this paper; see Veinberg and Wilbur (1990) for examples with multiple neg. Again, see Aboh and Pfau (2011) for arguments that [+wh]-words are focusers and not also interrogatives.

16. Neidle et al. (2000) claim that sentence-initial position of [+wh] is not possible. Nonetheless, Neidle (2002:77) provides an example who arrive? as part of the demonstration that the brow lowering must cover the whole domain and not just who. In addition, there are examples at their website (http://ling.bu.edu/asllrpdata/) of who in initial position: e.g., who hate fs-John? Lillo-Martin and Quadros (2010) present [+wh]-question data from a corpus of ASL in which initial [+wh]-signs are almost six times more frequent than those in final position (initial 44, final 8), with only three doubled [+wh]-signs, nine null [+wh]-signs, and no in situ [+wh]-signs. Watson (2010) analyzes a different ASL corpus collected in my lab. She records in detail all the NMMs used by 16 Deaf signing participants from different parts of the country and notes that regional dialect did not influence NMM use. For [+wh]-questions, she looked at sentence-final adjuncts (e.g., where, why), in situ and doubled constructions, and [+wh]-questions preceded by a conditional clause. For sentence-final adjuncts, she found that the [+wh]-sign could occur initially, finally, or in situ. Petronio and Lillo-Martin (1997) report that backwards NMM spreading is obligatory when the [+wh]-sign occurs in situ, but Watson reports that of the 68
It is well-known that there are semantic classes of verbs like wonder that require their embedded complements to be [+wh]-clauses, thus providing a test for whether a clause has [+wh] in its C head — illustrated in (8) for English and (9) for ASL.

(8) √Cary wonders whether the movie will start on time.
    *Cary wonders that the movie will start on time.

(9) ASL
    a. *cary wonder that susan buy.
    b. [+wh] in situ:
       [____________________ bl]
       cary wonder [susan buy what yesterday]
       [____________________ bl]
       *cary wonder [susan buy what yesterday]
    c. [+wh] fronting:
       [____________________ bl]
       cary wonder [what susan buy \(t_{\text{wh}}\) yesterday]
    d. [+wh] sentence finally 1:
       [____________________ bl]
       cary wonder [susan buy \(t_{\text{wh}}\) yesterday what]
    e. [+wh] sentence finally 2:
       [____________________ bl]
       cary wonder [susan buy \(t_{\text{wh}}\) yesterday what]

In (9b–d), note that there is brow lowering, and that it spreads across the whole embedded [+wh]-clause, regardless of the position of what. Two questions arise here: (1) What accounts for the spread of brow lowering in these examples? (2) Where is what located in (9c–e)? In Section 3.2.1, I address the first question and in 3.2.2, the second.

3.2.1 Accounting for the spread of brow lowering
Since the clause can be the complement of wonder, we know that it must be headed by C containing [+wh], the NMM for which is brow lowering (9b’).
Like (7c), where the negative headshake covers the whole scope of the negative in ASL because there is no negative manual sign in the head of NegP, the brow lowering spreads over all of "SUSAN BUY WHAT YESTERDAY" because there is no [+wh]-sign in the head of CP.

Similarly, when the wh-sign WHAT moves to spec,CP in the embedded clause, ‘bl’ covers all of the embedded clause (9c’) (Neidle et al. 2000).

When WHAT moves to the head C of the embedded clause, ‘bl’ may again spread (9d’). Aarons et al. (1992, 1995) have shown that it is possible in ASL to have ‘bl’ on just the [+wh]-sign but only when the [+wh]-sign is in final position, thus we have (9e’).

The next issue is to document the location of ‘bl’. One possibility is that it is associated to the [+wh]-sign, i.e., that it is introduced into the sentence with WHAT (Figure 2a). The other is that it is associated with the presence of the [+wh] feature in C (Figure 2b). Note that, other than the location of ‘bl’, the structures in Figures 2a and 2b are the same and are generally uncontroversial, with the exception of ‘UNDERSTAND’ to be discussed in Section 4.2.
Various formulations are available for what might be the next step in Figure 2a, depending on assumptions related to (1) whether ‘bl’ can move without what, and (2) whether what moves with ‘bl’ to C, or to spec,CP on the right (as argued by Neidle et al. 2000; Cecchetto et al. 2009 for LIS). Either way, eventually Figure 2a would yield a counterpart to 2b, where ‘bl’ spreads over the c-command domain of C with [+wh] or spec,CP (i.e., up one node, down all the others).

How do we choose between these trees? The one which has ‘bl’ associated with what (Figure 2a) should allow the ‘bl’ to spread over what only, but sentence (10) is no good (see also the ungrammatical example in 7b above) (Aarons et al. 1992, 1995).

(10) *john buy what yesterday

Hence, the conclusion is that ‘bl’ is not lexically associated with what. In Wilbur (1995b), I argue that NMMs such as ‘bl’ and ‘br’ mark the presence of operators. Accordingly, and as just briefly demonstrated, ‘bl’ is associated with [+wh] in C, as shown in Figure 2b.

3.2.2 Accounting for the location of what

The second question is where what is located in (9c’) when it is fronted. Under standard assumptions in syntax, when what is fronted in those languages that permit it, it goes to spec,CP and agrees with the [+wh] feature in C (and there are options as to how CP is formulated; see footnote 2). But there are two different trees currently under discussion in the ASL literature. In Sandler & Lillo-Martin (2006), Wilbur (2005), Šarac et al. (2007), Wilbur & Patschke (1999), and Churng (2006, 2008, 2009), spec,CP is on the left. For these authors, what moves to spec,CP. It agrees with C[+wh] and is included in the spreading domain of brow lowering. Thus, sentence (9c’) gets ‘bl’ from C[+wh].

However, in Neidle et al. (2000, inter alia), spec,CP is on the right; they provide sentences like (i) in support, to show examples that have [+wh]-phrases, and not just [+wh]-signs, on the right. The difference would be that in an example with just a [+wh]-sign like what, it could be argued to sit in the head C, but a [+wh]-phrase cannot sit in a head, only in a specifier, thus suggesting that spec,CP is on the right. Example (ii) is from Aarons et al. (1992: 105).

(i) john see [t] yesterday which teacher two-of-them?

(ii) john read [t] yesterday which book?

These ASL examples can be seen as the translations of English echo questions (iii), which we do not take as evidence that English has rightward [+wh]-movement to spec,CP (Wilbur 1995b). By echo questions, we mean that the pragmatics and prosody of the sentence are determined by a specific context, in which someone either missed what was said, thereby using (iii) to request
This raises the question of the location of what in sentence (9c), which is generally referred to as ‘wh-fronting’. Since C is on the right (with the caveat regarding understand′), what cannot be in C. For those who accept spec,CP on the left, what has gone to that position. But for those who postulate spec,CP on the right, this is not a possible location for the [+wh]-sign to be. To account for this, Neidle et al. (2000, inter alia) postulate that ASL allows a [+wh]-topic position on the left, and observe that [+wh]-phrases on the left can take brow raising, the typical marking of topic, with a slight modification to account for the fact that it is a [+wh]-expression. It is not clear how such a position can be maintained, especially for sentence (9c), given its brow lowering across the embedded CP complement of wonder.18

Finally, it is necessary to note that not all expressions containing a wh-sign are [+wh]. For example, in English, relative clauses contain wh-words that can often be replaced by that (except after a preposition): The math teacher who/that is substituting for Mr. Fitch is really a biology specialist. A more complex example is seen in sentences that contain what appear to be embedded wh-clauses, but which are ungrammatical when embedded under a verb that requires a [+wh] complement (11).

\begin{itemize}
\item (11) *Cary wondered [what Susan bought was a new suit.]
\end{itemize}

Similarly, in ASL, example (12) is ungrammatical; note that the wh-part of the embedded clause has brow raise on it, to which we will return shortly.

\begin{itemize}
\item (12) a. *cary wonder [susan buy what, new suit]
\item b. *cary wonder [what susan buy t, new suit]
\end{itemize}

The fact that what Susan bought was a new suit cannot be embedded under wonder, which requires a [+wh] complement, indicates that what Susan bought was a new suit is not [+wh], i.e. does not have [+wh] in its C head. The [+wh] feature associated with what is located in the C head of the embedded clause what Susan bought, not in the main clause (Wilbur 1996).

\begin{itemize}
\item (iii) a. John saw [t] yesterday which two teachers?
\item b. John read [t] yesterday which book?
\end{itemize}

18. See Wilbur (1995b) for additional arguments, including arguments against the position that conditionals are topics, which is used as part of their support for treating [+wh]-phrases as topics. It should also be noted that to my knowledge none of the other researchers have reported this [+wh]-topic NMM.
There is one final distinction between use of wh-words in English and ASL that needs to be emphasized. This involves their behavior in two structures, the wh-cleft, which requires that the missing information be provided, and the free relative, which does not. Compare (13) and (14) in English:

(13) What Teri did was burn the toast. (wh-cleft)

(14) What Teri did was stupid. (free relative)

In the wh-cleft (13), Teri did something identified as *burn the toast*, so *burn the toast* is the missing information requested by *what*. This relationship was identified by Rapoport (1987: 127) as “not specify[ing] a property of the subject…” but rather “referential; that is, it denotes a specific entity in the universe of discourse”, namely, it identifies what Teri did. Note its reversibility: *Burn the toast is what Teri did.*

In the free relative (14), what Teri did is never identified, but the speaker’s ‘evaluation’ that it was stupid is presented; that is, the information *stupid* predicates something of *what Teri did* but does not refer to (i.e., denote a specific entity) what Teri did, which remains unidentified. The comparable unclefted form *Teri did ____ which was stupid* is incomplete with respect to what Teri did. Note also the lack of comparable reversibility (i.e., *Stupid is what Teri did*). Thus, in English wh-words may be both referential and non-referential.

In ASL, the rare non-referential uses are identified as ‘Englishy’ and dispreferred, whereas referential uses are perfectly acceptable. The wh-cleft is permissible because it provides the missing information (15), but the free relative without the missing information is not (16).

(15) teri do+, burn toast

(16) *teri do+, stupid

It should be noted that the problem with (16) is not due to the focusing of *stupid* or of its evaluative nature (i.e., stupid [activity] = burn the toast), as both (17) and (18) are good:

(17) teri think sam what, stupid

‘What Teri thinks Sam is is stupid.’

comparable to ‘What Teri did was burn the toast.’ (wh-cleft)

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19. Note that (15) has no overt [+wh]-sign (Petronio & Lillo-Martin 1997).
Thus, we end this section with examples that demonstrate differences in wh-word behavior. In examples (11–12), we show that sentences containing wh-words may have the wh-clause embedded so deeply that the [+wh] feature is not relevant to the main clause. In examples (13–18), we show that there are different constraints on possible wh-word usage in English and ASL (Wilbur (1996) provides additional examples that ASL allows and English does not, so it works both ways). Of relevance to the present line of argumentation is that all the ASL examples in (12) and (15–18) contain wh-words which are associated not with brow lowering, but with brow raise, which will be explained in Section 4.

3.3 Summary

In this section, we have shown that [+neg] and [+wh] are monadic operators that take a single input constituent on which they operate, and that their associated NMMs spread over their c-command domain. According to my analysis, the presence of the NMM is licensed by the operator, which itself is licensed by semantics, and the NMM spread is over a syntactically defined structure.

4. Dyadic operators in ASL

4.1 [−wh] — A dyadic/restrictive operator

We turn now to brow raise ‘br’. One immediate question is what it is doing on the embedded wh-clause in the ASL sentences in (12) and (15–18). A second related question is why it does not continue over new suit in (12) or stupid in (17) or burn toast in (18), as might be predicted by the intonation/prosodic approach to NMMs or by the dependency marking approach (Cecchetto et al. 2009), since new suit would appear to come between the wh-word and the C head. It is important to understand that ‘br’ is not functionally/semantically/pragmatically determined by ‘presupposed, old, given’ information as suggested in earlier literature. Coulter (1978) argued that ‘br’-marked phrases all describe background, non-asserted information. However, this is not correct. Wilbur and Patschke (1999) note a near-minimal pair:
Focus information in (19a) is provided in contrast to other information that the signer believes the addressee holds. In (19b), Mary is (re-)established as the topic of discussion; it is asserted about her that Jim loves to tease her. This analysis has two implications, one for stress marking and the other for marking of topics. First, Mary in (19a) is the focus and therefore receives primary stress for the sentence; in (19b), the primary stress appears in the main clause jim love tease (Wilbur 1999b). Second, Aarons (1994) discusses three markings for topics. Her ‘tm1’ is used on topocalized (new/contrastive) constituents that have been moved from their original position; in (19a), Mary is the underlying object of tease and can occur only with ‘tm1’; furthermore Mary is new information. In (19b), Mary is a plain topic (hence, given/definite) with ‘tm2’ marking. In both cases, Mary is ‘br’-marked, but other distinctions mark each function. In addition to ‘br’ and widened eyes, ‘tm1’ has slight head tilt back and to the side, whereas ‘tm2’ has large head movement back and to the side (Aarons 1994: 156).

Also, despite what Coulter would predict, structures containing sentence- or discourse-old information do not get brow raise:

(20) a. Context: The stork has invited the fox to a meal.20

FOX EXCITED
‘The fox is excited.’

b. Context: Childhood story about grandfather and his radio21

MY GRANDFATHER HEARING…GRANDFATHER LOVE KISS-FIST RADIO
‘My grandfather was hearing… My grandfather really loved his radio.’

Taken together, examples (19–20) show that ‘br’ can occur on both old and new information and not just backgrounded information as originally suggested by Coulter (1978), and that it does not even predictably occur on backgrounded/old information as shown in (20) (Wilbur & Patschke 1999).

I am arguing here that the presence of ‘br’ is due to a dyadic semantic operator, one that has a restriction separate from its main scope. One example of such

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20. From the published video “The Fox and The Stork” performed by Patrick Graybill, Sign Media, Inc.

21. Produced by Mary Beth Miller in Live at SMI!, Sign Media, Inc.
an operator is focus. The clearest cases are those discussed by Rooth (1985, 1992),
namely focused nouns associated with focus particles. Rooth argued that the focus
particles occupy the head D, and the focused 'associate' is required to move from N
to spec,DP. Spec,DP has already been identified as an operator position (Szabolcsi
2001; Kayne 1994). In ASL, these focused associates appear with 'br'; the focusers
themselves (that, same 'even', only-one 'only') do not. In my analysis, this fol-
low straightforwardly: the focuser is associated with a restricting [−wh] operator,
the focused associate is in the restriction and gets 'br' in spec,DP. Example (21)
shows the focuser that, the ASL equivalent of English 'it'-clefts (S. Fischer p.c.).
Note that the 'br' on beans in spec,DP does not spread to that in D despite being
higher and preceding it, that is, c-commanding it.

(21) Context: And what about Fred? What did he eat?

____ br

BEANS THAT, FRED EAT

'It's BEANS that Fred ate.'

Preposing of the focus associate appears to be optional for same and only-one
(compare 22 and 23a). The present analysis also provides an account for the ab-
sence of 'br' on NPs following same, only-one, and demonstrative that. There
are several phrases below DP and above NP; non-focusing demonstratives, quan-
tifiers, and numbers (23b), which lack operator force and hence 'br' NMM, appear
in the head of one of those phrases (Alexiadou 2001; Svenonius 2008).

(22) KIM ONLY-ONE GET-A

'Kim is the only one who got an A.'

(23) a. ONLY-ONE KIM GET-A

'Only Kim got an A.'

b. THREE STUDENT FAIL TEST

'Three students failed the test.'

Relative clauses are also marked by 'br' in ASL and relative clause movement (ex-
traposition) is possible (24a,b; from Liddell 1977, 1978). Example (24a) again il-
lustrates that 'br' does not spread over its c-command domain — the sentence
subject dog is associated with the relative clause the dog that chased the cat, and

22. It may be that whether the associate precedes or follows in ASL is determined by the refer-
entiality (specificity, or 'rigid designator status') of the NP (Abbott 1994).

23. Similarly, Lillo-Martin and Fischer (1992) proposed QP below DP. Additional examples
demonstrating that non-focusing quantifiers and numbers do not result in 'br' over their NPs
may be found in Boster (1996). The internal structure of DPs in ASL deserves further analysis.
has ‘br’ on it that does not spread to the main predicate bark, even though, as subject, the dog that chased the cat c-commands bark.

\[(24)\]  
\[\text{a. } [[[\text{dog chase cat}]]_{\text{NP}} \text{ bark}]]\]  
‘The dog that chased the cat barked.’

\[\text{b. DOG BITE}_1 [[[\emptyset \text{ chase cat before}]]_{\text{that}}]_{\text{NP}}\]  
‘The dog bit me that chased the cat before.’

All sentence final relative clauses must end with that (Liddell 1977, 1978); as (24b) and (25a) show, like the focuser that, relative clause that is outside the ‘br’ domain. This fact supports my claim that that occupies the relative clause head-final C (C_{rel} in CP_{rel}) with the rest of the relative clause in the relative clause operator restriction spec,CP_{rel}, where it is marked with ‘br’ (structure is shown in brackets in 25b).

\[(25)\]  
\[\text{a. } 1\text{ASK}_3 \text{GIVE}_1 \text{DOG} [[[\text{ursula kick}]]_{S \text{ that}}]_{\text{DP}}\]  
‘I asked him to give me the dog that Ursula kicked.’

\[\text{b. } 1\text{ASK}_3 \text{GIVE}_1 \text{DOG} [[[\text{spec,DP[spec,CP[spec,TP \text{ursula kick }\emptyset \text{TP]_{spec,CP}}]}_{\text{spec,DP}}]}_{\text{spec,CP}}_{\text{that}}]_{\text{CPrel}}]_{\text{DP}}\]  

It is also possible to put a relative clause into focus with the focuser that. (26a) shows a normal object relative clause; (26b) shows the effect of focuser that. The relative clause that, which normally is outside the ‘br’ domain, gets ‘br’ from focuser that when it is moved to the focus operator restriction in spec,DP with the rest of the relative clause CP, which is intensified (shown by ‘i’).

\[(26)\]  
\[\text{a. } IX_1 \text{FEED} [[[\text{dog bite cat}]]_{\text{that}}]_{\text{DP}}\]  
‘I fed the dog that bit the cat.’

\[\text{b. } IX_1 \text{FEED} [[[\text{dog bite cat that}]]_{\text{CP that}}]_{\text{DP}}\]  
‘I fed the dog that bit the cat.’

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24. The relative clause examples were originally provided by Liddell (1978). The syntactic analysis of the phrasal structure is my own; to clarify the syntactic structure, I have here added further node markings to what I had in Wilbur (1997). Kayne’s (1994) suggestion that relative clauses are the CP complement of D is attractive here.
The two *thats* can be separated because versions of this and related sentences that we have elicited systematically mark relative clause *that* with a lean forward (and concomitant eye gaze to the location of the referent) and focuser *that* with a lean back (Wilbur 1997; Wilbur & Patschke 1998). As with other items focused in spec,DP, the focuser *that* remains outside of the ‘br’.

Thus, we have provided evidence that ‘br’ is unlike ‘neg hs’ and ‘bl’ in ASL: ‘br’ is *always* contained in its own Intonational Phrase (IntP), whereas ‘bl’ spreads syntactically over its c-command domain and does not create its own separate IntP. This distinction is important because if one wanted to maintain a prosodic analysis of these NMM, the difference needs to be explained. A syntactic analysis will also not work given that both ‘bl’-marked and ‘br’-marked constituents have c-command domains; one spreads over it without making a new IntP; the other does not spread that far and does make a new IntP. Pfau (2005, 2006) notes this difference, and suggests that there are simply two possible behaviors: associating to the specifier, which creates an IntP, or spreading over c-command domain, which does not. This leaves the question open — what happens when and why?

We have provided examples of ‘br’ on two types of topic (19a,b), focus associates (21, 22), relative clauses (24, 25, 26a), and focused relative clauses (26b). Over a period of years, I attempted to identify what all the structures that have ‘br’ have in common, looking at pragmatic/discourse status (Wilbur 1994a, 1995a, 1996, 1999a; Wilbur & Patschke 1998), prosodic (Wilbur 2000; Wilbur & Martinez 2002), and syntactic factors (Wilbur 1998; Wilbur & Patschke 1999), as well as combinations thereof (Wilbur 1991, 1997). In Wilbur (1995b; Wilbur & Patschke 1999), I suggested operator structure and the idea of ‘br’ as an overt marker of the presence of an operator, but did not yet fully appreciate the differences among monadic and dyadic operators and the relevant differences in behavior (the statement in Wilbur & Patschke (1999) was “brow raise occurs in the A′-positions of structures headed by restrictive [−wh]-operators”). Quer (2005) provided a key when he separated D-quantification (determiners, *some, any, most, …*) and A-quantification (adverbs, affixes, auxiliaries, and argument adjusters) for Catalan Sign Language (LSC) and ASL. For present purposes, D-quantification is monadic and A-quantification is dyadic. We have seen that negation and [+wh] are monad-
ic operators, taking a single constituent in their scope. In contrast, ‘br’ occurs with a dyadic operator that I have labeled [−wh] for convenience, and ‘br’ spreads only over the [−wh] restriction. The restriction is a separate constituent in the specifier (Partee 1995; Diesing 1992) and hence the generation of a separate Intonational Phrase (IntP) is not unexpected (Wilbur 1994b). We will see this same behavior in the last two structures to be discussed here — conditionals and the above wh-clauses that have ‘br’ on them.

Recall that our introduction to dyadic operators used as an example of the conditional If X, (then) Y the sentence If it rains tomorrow, the picnic will be cancelled. In ASL, this can be rendered as (27), and is produced as (28) on a published video.27

\[ \text{(if) rain tomorrow, picnic cancel} \]

‘If it rains tomorrow, the picnic will be cancelled/is cancelled.’

As expected, in (27) and (28), there is ‘br’ over the conditional clause. (28) also shows ‘br’ on the topic picnic. There are two points to be made about the presence of multiple ‘br’ in (28). First, as already mentioned in passing, depending on the signing rate, adjacent occurrences of the same NMM, in this case ‘br’, may integrate prosodically into one longer ‘br’ covering the same signs with no return to neutral brow position in between them, or they may be carefully distinguished as separate (Churng’s 2009 ‘resetting’; integration on NMMs with signs as a function of signing rate is documented in Wilbur 2009). Thus, prosodic behavior is expected to affect both manual signs and nonmanuals, but a completely prosodic explanation for NMM behavior fails to explain both the differences observed in spreading behavior and the observation here that two ‘br’ can be either distinct or collapsed. Second, there is the fact that there are two different operators associated with the ‘br’ in (28) — the topic and the conditional (Partee 1995 provides discussion of the restrictive nature of these two operators, among others). We can easily show that there could be a third, the interrogative (29):

\[ \text{(fs)picnic, rain tomorrow, cancel} \]

‘If it rains tomorrow, will the picnic be cancelled?’

And again, they can be produced as one single longer ‘br’, but the requirements remain the same — the brows must go up at the beginning of the domain, and un-
less interrupted by a lexical item or an affective/emotional attitude requiring use of the brows in some other position, remain up until they come down at the end of the domain (Weast 2008). Thus, multiple ‘br’ domains reflect multiple semantic operators. Neither the syntactic nor the prosodic/intonational approach can predict these occurrences but must stipulate them.

Finally we turn to the ‘br’ that occurs on the wh-clauses in the wh-cleft (12, 15–18). The wh-cleft construction is a specialized syntactic focus construction which permits focusing of constituent categories that cannot be focused by focusers in DP or by so-called that-clefts (the ASL equivalent of English it-cleft) (Wilbur 1996). The wh-cleft differs from these other focusing options in another way, namely that the ‘focused’ information in the wh-cleft does not have ‘br’ on it (cf. focused NP in 19a and 21–22, focused relative clause in 26b) but rather the ‘br’ marking is on the presupposed/old information. There has been much recent discussion of whether the construction is properly a wh-cleft (aka ‘pseudocleft’), or a ‘clausal question answer’ pair (cf. Grolla 2004; Davidson et al. 2008a,b; Caponigro & Davidson, in press). The ‘clausal question-answer’ approach follows Schlenker’s (2003) ‘Question in Disguise Theory’. From this perspective, the wh-clause has ‘br’ on it because it is really an interrogative, and as we have seen, the interrogative operator [+interrog] is dyadic and associated with ‘br’ on its restriction.28 Schlenker’s ‘Question in Disguise Theory’ is in some ways reminiscent of Prince’s (1986) analysis of wh-clefts as containing an “open proposition [OP]”. Prince (1986: 209) notes that presupposed OP’s contain a variable \( x \) and the focused constituent should provide the value corresponding to \( x \). In both approaches, there is something missing that must be provided by the answer/focused constituent. It is not clear that one can tell the difference in ASL at this point, as both approaches yield ‘br’ as the associated NMM on the wh-clause. However, the ‘clausal question answer’ approach itself, as formulated by Davidson et al., leaves open the question of why the wh-clause, being interrogative with a wh-word, does not have ‘bl’ on it.29

Once we understand the function of ‘br’ and the domain over which it spreads, we can see the argument for putting spec,CP on the left in ASL (Figure 3a) and the

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28. The interrogative ‘br’ marking is discussed at length in Šarac Kuhn et al. (2006, 2007).

29. There are additional problems with these efforts at reanalysis. In some, Davidson et al. accept the legitimacy of Hoza et al.’s (1997) claim that there are yes/no clausal question–answer pairs. Furthermore, they note the wider distribution of the range of wh-words that occur, but they do not show, as Hoza et al. also do not, that these additional examples actually meet the required tests to be included in the data to be accounted for (for example, involving focus). I have a fair amount of skepticism regarding these additional examples, given the reactions of my consultants, who consider many to be simply plain questions followed by answers with no apparent reason to posit a single higher clause containing them, especially for the yes/no examples.
problem to be solved for those languages that appear to have spec,CP on the right (3b). In both spec,CP and spec,DP, the traditional operator-associated locations, ‘br’ marks the material in the operator restriction, and both are on the left. Even with the head C on the right, the ‘br’ does not cover the intervening material in TP.31

![Figure 3. (a) spec,CP on left (b) spec,CP on right](image)

### 4.2 The understand’ puzzle

We turn now to the puzzle presented by understand’ in (30–31), discussed in Fischer and Lillo-Martin (1990).

(30) pro.1 go store now night, understand’ you watch my children, ok?
    ‘I’ll go to the store tonight provided that you watch my children, ok?’

(31) pro.1 adore chocolate, understand’ allergic index(chocolate)
    ‘I love chocolate, although I’m allergic to it.’

Fischer and Lillo-Martin (1990) note that understand’ in (30–31) differs in formation from the verb understand in two ways: The movement in understand’ is repeated, and there is nonmanual marking consisting of ‘br’, chin thrust, lip raise and eye widening (1990:72). Note first that like the other dyadic operators discussed so far, the ‘br’ on understand’ does not spread over the c-command domain you watch my children. Fischer and Lillo-Martin suggest that understand’ is a subordinating conjunction with roughly the semantics ‘provided that, as long as, although’. Thus like the other dyadic operators, understand’

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30. Note that we do not have an expectation that ‘br’ is the marker for [−wh] operators in all sign languages — for example, it marks Neg/T in TÏD (Gökgöz 2009).

contributes a restrictive relational meaning, relating the first clause to the conditions in the second clause under which the first clause may/will be true, something roughly equivalent to ‘A iff B’ (‘A under conditions B’). Syntactically it may be a subordinating conjunction, but its semantics matches those of dyadic operators.

What is the puzzle presented by understand’ in these examples? Unlike other clause-level dyadic operators discussed so far, understand’ is not in sentence initial position, but it is the first sign in the second clause. The question is, where is understand’ located? Initially, Susan Fischer (p.c.) suggested that understand’ is located in C, and might be evidence against having C on the right. Under the current analysis, understand’ is not in C, which is on the right, but in spec,CP, which we have argued is on the left. understand’ then provides further evidence for spec,CP on the left. understand’ is the ‘br’-marked restriction in spec,CP of the second clause, where it is associated with a [−wh] dyadic operator in C, that is, the restriction ‘under these conditions’. Our analysis of understand’ as associated with a dyadic operator requires no modifications to the syntax we have assumed — spec,CP is on the left, C is on the right, ‘br’ does not spread over its c-command domain, and we see that ‘br’ is a very different kind of nonmanual than negative headshake and [+wh] brow lowering. These distinctions must be taken into account when issues related to nonmanuals are addressed.

5. Conclusion

The larger NMM debate has generally failed to consider that there is a clear difference between raised ‘br’ and lowered brows ‘bl’ or negative headshake ‘neg hs’. The difference is captured by the semantic distinction between monadic and dyadic operators, which correctly accounts for their occurrence and the constituent syntax which they cover. Negation is a monadic operator: it scopes over what it negates. Similarly, a [+wh]-operator scopes over what it focuses (to understand whether it is just one sign or an entire phrase requires more details on the relationship between focus and stress; see Selkirk 1986, 1995). Syntactically, these scopes are the c-command domain of wherever the operator functions in the syntax. In ASL, we see this: negation marked by negative headshake over its c-command domain, and [+wh]-operator marked with ‘bl’ over its c-command domain.

In contrast, dyadic operators relate two semantic constituents to each other (Krifka et al. 1995), and one restricts the domain in which variables in the other may be interpreted. The operator binds variables in the restriction; those in the nuclear scope are bound by (monadic) existential closure. Dyadic operators apply to various constructions: conditionals, interrogatives, focus structures, relatives, and generics (Lewis 1975; Partee 1991; Carlson & Pelletier 1995; Chierchia 1995).
In ASL, the part that restricts subsequent interpretation is marked with ‘br’: a conditional clause provides the conditions under which the next clause is likely to hold; without ‘br’, the two clauses are read as conjoined. Thus, ‘br’ has a narrowly defined domain and cannot spread over its c-command domain. This analysis also provides an explanation for the list of ASL structures that take ‘br’, which the pragmatic, syntactic, and prosodic approaches cannot do.

Syntactic tradition puts operator-associated material in spec,CP, the position of which is debated for ASL [left: Petronio & Lillo-Martin 1997; right: Neidle et al. 1998, 2000], with C on the right. However, Fischer (p.c.) suggests that understands’ is in C on the left in the second clause, arguing against the placement of C on the right. Recognizing understands’ as associated with a restrictive operator accounts for its initial position in the second clause and presence of ‘br’, parallel to other dyadic operators, in spec,CP, not in C.

Hence, we have a uniform treatment of ASL spec,CP on the left (position of restrictive operators) and head C on the right. This analysis provides a consistent explanation for the NMM difference: dyadic operators with ‘br’ only on the restriction; monadic operators [+wh: brow lowering] and [+neg: headshake] cover all or part of their scope/c-command domain. It provides evidence against the right-edge spec,CP analysis of Neidle et al. (2000) and the intonational/prosodic function suggested by Sandler and Lillo-Martin (2006).

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