

## **Brow Raise in American Sign Language: An Emergentist Account\***

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**Abstract:** This paper offers an analysis for brow raise, a non-manual sign whose precise function in ASL has long been a mystery. I begin by considering the pioneering proposal put forward by Wilbur & Patschke (1999) within the Principles-and-Parameters theory, noting various problems. I then outline an alternative account within an emergentist framework that eschews the use of formal principles of Universal Grammar in favor of efficiency-based processing propensities.

**Key terms:** sign language, brow raise, emergentism, processing, garden path

### **1 Introduction**

It is now quite widely agreed that sign language and spoken language are manifestations of a single language faculty, sharing basic properties that distinguish them from other types of communication (e.g., Meier 2002, Neidle 2002:71, Sandler & Lillo-Martin 2006, Crasborn 2007:107). This finding is deeply important, but a more fundamental question remains—what is the nature of the language faculty underlying the spoken and signed modes of linguistic expression?

One view, dominant in formal linguistics since the early 1960s, holds that an inborn system of grammatical categories and principles—Universal Grammar (UG)—lies at the heart of the human language faculty. Not surprisingly, this view has been extended to sign language as well. Fromkin (2000:542) offers a succinct statement of this approach: ‘the same abstract principles underlie all human languages—spoken or signed. These are the universal principles that theoretical linguists call “Universal Grammar”.’ Lillo-Martin (2000:243) makes the same point: ‘the abstract principles of UG apply equally to languages in the signed and spoken modalities... Where UG constrains the form of spoken languages, it will constrain sign languages as well.’ Lillo-Martin (1991), Neidle et al. (1999), Wilbur (2006), and Sandler & Lillo-Martin (2006), among others, have made important and influential contributions along these lines to the study of sign language.

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UG-based theories of language have had to confront challenges from two very different quarters in recent years. One type of challenge comes from work on the Minimalist Program, which rejects the sorts of grammatical laws (Principle A, the Subadjacency Condition, the Empty Category Principle) that were a staple of most work in the field over the last several decades. Chomsky (2005) is among those who have adopted this position, suggesting that ‘there is no longer a conceptual barrier to the hope that UG might be reduced to a much simpler form’ (p. 5) in which the basic properties of language are explained in terms of ‘computational efficiency and the like’ (p. 9); see also Berwick & Chomsky (in press). Other work has called into question both the role of UG in understanding language variation (Newmeyer 2004) and its relevance to language acquisition (Longa & Lorenzo 2008).

A second type of challenge to the UG paradigm comes from outside the generative tradition. First developed as an approach to understanding complexity in the natural world, *emergentist* theories hold that the properties of syntactic phenomena result from the interaction of more basic forces and propensities, particularly those relating to processing efficiency.

One idea in this regard has been put forward by Hawkins (2004) and O’Grady (2005), who suggest that an efficiency-driven processor (that is, a processor that seeks to minimize the burden on working memory) is the key component of the human language faculty, at least with respect to syntax. Its effects, they argue, offer key insights into the issues that define work in syntactic theory:

- i. Why does syntax of human language have the particular properties that it does?
- ii. Why is typological variation involving those properties restricted in particular ways?
- iii. How are those properties acquired by children, based on experience that is limited in particular ways?

O’Grady (2008) presents an overview of some recent contributions to the study of language from this perspective.

The purpose of this paper is to explore the prospects for a processing-based approach to sign language. I begin in the next section by briefly reviewing work that acknowledges the general importance of processing considerations to an understanding of the organization of sign language, and then turn in section 3 to a specific phenomenon—brow raise in American Sign Language (ASL)—whose intricacies present a substantial challenge for all approaches to syntax. Taking as a starting point the pioneering UG-based analysis of this phenomenon put forward by Wilbur & Patschke (1999), I propose an emergentist alternative that treats brow raise as a processing-motivated phenomenon. I conclude with some general remarks about the prospects of the emergentist program for language in general and its relevance to work on sign language.

## 2 Syntax and processing

### 2.1 *The place of processing in the study of spoken language*

The relevance of processing considerations to the workings of human language has never been in dispute. From the early days of work on generative grammar, processing considerations have had a significant but circumscribed place in syntactic theory. Within the generative tradition, the standard view of how the language faculty is organized posits both a *grammar*, which is responsible for matters of well-formedness, and a *processor*, which uses grammatical information as it goes about producing and interpreting sentences in the course of actual speech (e.g., Fodor 1989:177ff, Frazier & Clifton 1996:9 & 25, Frazier 1998:126, Jackendoff 2002:31 & 57). On most accounts, there is a sharp asymmetry in the relationship between the two cognitive systems: the processor is subservient to the grammar. The ‘most basic assumption about the nature of the human sentence processor,’ Ferreira, Christianson, & Hollingworth (2001:13) write, is ‘that it obeys the fundamental principles of grammar when constructing interpretations.’

More recently, however, an increasing number of proposals, especially within the emergentist framework, adopt the much stronger view that the properties of core syntactic phenomena—including binding, control, agreement, scope, filler-gap dependencies, and the like—are better understood by reference to processing considerations than grammatical constraints (e.g., Hawkins 2004, O’Grady 2005, Hofmeister & Sag 2010). As we will see next, this perspective is potentially relevant to the study of sign language as well.

### 2.2 *The place of processing in the study of sign language*

Within the sign-language research community, there seems to be a general consensus that processing has an important role to play in understanding key aspects of the morphosyntax of ASL and other sign languages (e.g., Emmorey 2002, Aronoff et al. 2005). There is no controversy over the view, put forward by Wilson et al. (1997:151), that sign language, like speech, is a ‘dynamically expressed’ form of communication ‘that depends upon temporal structure at both the phonological and syntactic level.’ Moreover, it is widely agreed that manual signs take longer to articulate than do speech sounds (Wilson et al 1997:152, Emmorey 2002, ch. 4, Wilbur 2006:25), and that this creates a potential processing bottleneck which all sign languages manage in essentially the same way, through the concurrent use of manual and non-manual signs (e.g., Bellugi & Fischer 1972, Emmorey 2002, ch. 4, Aronoff et al. 2005). ASL and other signed languages, Wilbur (2006:25) observes, ‘rely on [this] layering to communicate the



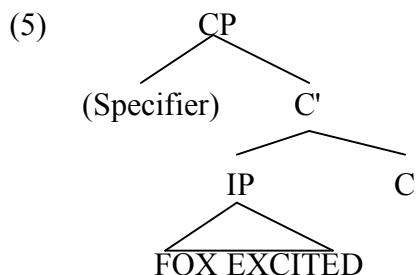
On the other hand, as Wilbur & Patschke also note (p. 15ff), many phrases that express background-related, old, given or presupposed information—most obviously subjects—are not accompanied by brow raise. The following sentence occurs as part of a story about a fox, in a context in which he has been invited to a meal and is clearly the discourse topic. Yet the corresponding noun (the sentence’s subject) is not marked by brow raise.

- (3) FOX EXCITED. (=W&P’s (19))  
 ‘The fox is excited.’

For these reasons, Wilbur & Patschke reject the pragmatic account of brow raise in favor of a syntactic analysis incorporating the following key claim (p. 34).

- (4) Brow raise occurs in the A' positions of structures headed by a [-wh] operator.

Following the usual practice within the Principles and Parameters framework, Wilbur & Patschke assume highly articulated syntactic representations in which clauses include at least two ‘functional’ layers (an IP and a CP), as illustrated in (5), corresponding to (3) above.



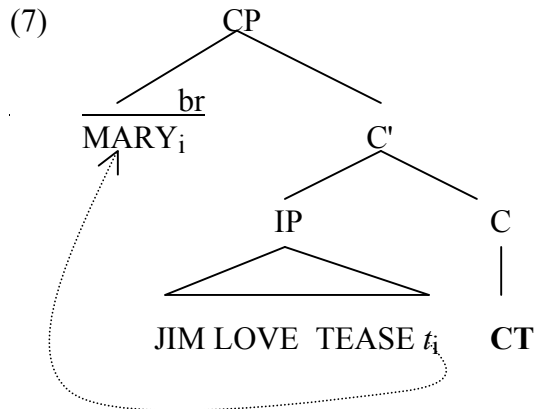
Two positions are particularly relevant for Wilbur & Patschke’s theory—the C position, which can house an operator of the relevant type (see below), and the specifier position (an A' position), which is the locus of brow raise (p. 18).<sup>1</sup>

A straightforward illustration of Wilbur & Patschke’s idea comes from the topicalization pattern exemplified in (6).

- (6) br  
 MARY<sub>i</sub>, JIM LOVE TEASE *t<sub>i</sub>*. (=W&P’s (41))  
 ‘It’s *Mary* that Jim loves to tease.’

<sup>1</sup> Informally and setting technical details to the side, A' positions correspond to positions other than those in which subjects and direct objects occur in a sentence’s basic word order. CP = complementizer phrase; IP = Inflectional Phrase, where ‘inflection’ is the cover term for the head that provides information about tense, regardless of whether that information is overtly expressed.

Wilbur & Patschke suggest (p. 24) that the NP *MARY* moves to the (A') specifier position within CP, which they take to be headed in this case by a null 'contrastive topicalization' operator (CT). The conditions for brow raise are thus satisfied: *MARY* occurs in an A' position in a structure (CP) that is headed by a *-wh* operator (CT).



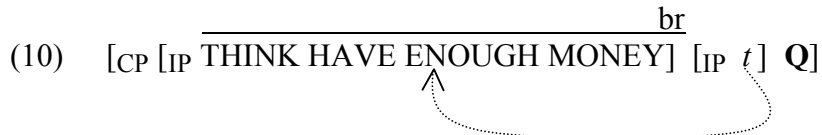
In other cases, matters are considerably more abstract. Consider, for instance, the simple *yes-no* question exemplified in (8), which manifests brow raise from beginning to end.

- (8)  $\overline{\text{br}}$   
 THINK HAVE ENOUGH MONEY (=W&P's (30))  
 'Do you think we have enough money?'

In order to subsume this pattern under their generalization, Wilbur & Patschke must posit a syntactic representation in which the phrase marked by brow raise (the entire clause) occurs in the specifier of CP, which in turn is headed by a [-wh] operator. Two assumptions are crucial. First, and uncontroversially within the Principles and Parameters framework, it is assumed that the C position of a *yes-no* question is headed by the [-wh] operator *Q*.

- (9) [CP [IP THINK HAVE ENOUGH MONEY] **Q**]

Second, Wilbur & Patschke propose—this time with less precedent and no independent evidence (Sandler & Lillo-Martin 2006:415)—that the *Q* operator triggers raising of the entire IP constituent to specifier position in CP, yielding (10). This creates the right configuration for brow raise, since the IP is now in an A' position within a projection headed by a [-wh] operator.



Still more abstract is the analysis required to account for the contrast between the sentence-internal negative in (11a), which does not trigger brow raise, and its sentence-final counterpart in (b), which does.

(11)a. Sentence-internal negation (no brow raise)  
 JOHN NOT DOCTOR. (=W&P's (37))  
 'John is not a doctor.'

b. Sentence-final negation (brow raise)

$\overbrace{\text{JOHN DOCTOR NOT}}^{\text{br}}$ . (=W&P's (33))  
 'It's not the case that John is a doctor.'

Here, Wilbur & Patschke (p. 23) propose two movements—NOT moves out of IP to the sentence-final C position, and the rest of the IP moves leftward to the specifier position in CP. (As Sandler & Lillo-Martin 2006:415 observe, however, no independent evidence is offered for movement of the IP.)

(12)a. Rightward movement of the negative to the C position:

$[\text{CP } [\text{IP } \text{JOHN } t_{\text{NEG}} \text{ DOCTOR}] \text{ NOT}]$

b. Leftward movement of IP to the specifier position in CP:

$[\text{CP } \overbrace{[\text{IP } \text{JOHN } t_{\text{NEG}} \text{ DOCTOR}]}^{\text{br}} [\text{IP } t] \text{ NOT}]$

The end result is once again a configuration that licenses brow raise on the IP, thanks to that constituent's appearance in the specifier position of a CP headed by a [-wh] operator (namely the moved negative).

It is not my goal to show that Wilbur & Patschke's analysis is 'wrong'; I wish simply to show that it is unnecessary, and that an alternative account for the brow raise facts can be grounded in processing considerations. I turn to this next.

### 3.2 Prelude to a processing account of brow raise

As explained in section 2, the centerpiece of the emergentist perspective on language adopted here is the hypothesis that a simple processor lies at the heart of the human language faculty. In the version of this idea developed in detail by O’Grady (2005), the processor has a single over-riding property—it is highly sensitive to limitations on working memory. On this view, the need to operate with maximum efficiency (i.e., with a minimum burden on working memory) not only shapes the functioning of the processor, it is responsible for many of the defining properties of grammatical systems.

A simple example of this involves the use of prosody in spoken language to avoid the sort of ‘garden path’ effect observed in sentences such as (13), from Frazier & Clifton (1996:10-11).

(13) Though George kept on reading the story bothered him.

In a case such as this, the processor’s first reaction is to interpret *the story* as direct object of *read*, only to discover an instant later that this is incorrect and that it is in fact the subject of *bother*. The required reanalysis comes at significant cost to working memory, which must support recovery and reanalysis of a previously interpreted string of words: Frazier & Clifton report that it takes readers about 50% longer to process (13) than (14), in which the initial interpretation of *the story* as direct object of *read* turns out to be correct.

(14) Though George kept on reading the story Sue bothered him.

In spoken language, prosody offers an effective strategy to avoid processing breakdown in many cases (e.g., Schafer et al. 2000): an intonational phrase boundary between *reading* and *the story* in (13) normally suffices to warn listeners against associating the two. As we will see next, consistent with the view that facial expression can have a prosody-like function (e.g., Reilly et al 1990 and Sandler & Lillo-Martin 2006:257, among many others), brow raise fulfills a similar function in ASL, brow raise appears to help the perceiver’s processor avoid what would otherwise be a costly error.

Two provisos accompany the proposal that I will be outlining. First, for the purposes of illustration, I draw largely on the data reported by Wilbur & Patschke, which I assume is accurate and representative. Second, grammatical devices tend to develop secondary uses as a matter of natural course, reflecting grammaticalization and other sorts of language change. This could easily be the case for brow raise too. The remarks that follow therefore focus on what I take to be the *principal* (but necessarily *sole*) function of brow raise in contemporary ASL.



### 3.3 Rethinking brow raise

The particular hypothesis about the function of brow raise explored here can be stated as follows.

- (15) Brow raise is used to warn against committing to a plausible (but incorrect) interpretation, thereby avoiding the need for later backtracking.

More precisely, I propose that brow raise averts the implementation of processing routines that seek out canonical phrases of various sorts, especially clauses such as (16) that express a positive realis assertion via an NP V X pattern.

- (16) DOG CHASE CAT  
 NP    V    NP  
*agent action verb*

‘There is a chasing action with a dog as agent and a cat as patient.’

It is well established that such routines play a major role in the interpretation of spoken languages (Townsend & Bever 2001, Ferreira, Bailen, & Ferraro 2002), where they contribute to the overall speed and efficiency of processing—despite the risk of occasional garden paths, as happens in (13). It seems reasonable to assume that comparable routines operate in sign language, with similar advantages and pitfalls.

The key idea that I wish to explore is that the risk of processing mistakes in ASL is systematically reduced by the use of brow raise. This in turn leads to the suggestion that the phenomenon is better understood in terms of processing facilitation rather than structural factors, obviating the need for principles that make reference to occurrence in an A' position within a phrase headed by a [-wh] operator, as Wilbur & Patschke's proposal does. I begin by considering several cases involving the interpretation of clause structure and NP structure, before turning to three examples relating to sentence modality.

### 3.3.1 Brow raise and clause structure

Although it is widely agreed that ASL has considerable flexibility in its linearization options, there is good evidence that the basic order is subject–verb–direct object (Lillo-Martin 1991:30, Liddell 2003:53ff, Sandler & Lillo-Martin 2006:288ff). In the absence of evidence to the contrary, a processor attuned to default expectations will therefore interpret a sentence-initial NP as subject and a post-verbal NP as direct object. As the next several phenomena show, brow raise has a crucial role to play in blocking these default mappings before they result in garden paths.

*Sentence-initial non-subjects.* Sentence-initial NPs that do not function as subjects are typically accompanied by brow raise.

(17) Sentence-initial NP functioning as subject—no brow raise  
JIM LOVE TEASE MARY.

(18) Non-subject sentence-initial NP—brow raise<sup>2</sup>  
br  
MARY, JIM LOVE TEASE.

As Wilbur & Patschke note (p. 14), the occurrence of the brow raise marker on the sentence-initial NP is independent of that element’s pragmatic status—it can be in focus (‘It’s Mary who Jim loves to tease’) or it can be an established topic of discussion (‘As for Mary, Jim loves to tease her’). The key fact is simply that the NP is not a subject—which creates the need to warn the processor against an early commitment to the usual default interpretation for a sentence-initial constituent.

A more extreme example of this use of brow raise is found in sentences such as (19).

(19) br br br  
ELLEN<sub>a</sub> SEAFOOD<sub>a</sub> *t<sub>a</sub> t<sub>b</sub>* EAT SHRIMP REFUSE (=W&P’s (42))  
‘As for Ellen, as for seafood, she refuses to eat shrimp.’

Here, as Wilbur & Patschke observe, three constituents (ELLEN, SEAFOOD, and EAT SHRIMP) occur ‘out of position’<sup>3</sup> and each is accompanied by its own brow raise marker. On my view, each instance of brow raise has essentially the same function—to alert the processor to the fact that it is computing a non-canonical structure.

<sup>2</sup> Such NPs can also be marked by a combination of brow raise and a backward tilt of the head (e.g., Liddell 2003:54ff).

<sup>3</sup> On Wilbur & Patschke’s analysis, ELLEN and SEAFOOD each move leftward—the first to Topic Phrase and the other to a Left Dislocation Phrase; the predicate EAT SHIMP moves leftward as well, to the specifier position in CP, while REFUSE moves to the C position.

This does not mean that only brow raise can serve this particular function. Non-subject sentence-initial constituents of the type illustrated in (20), from Aarons (1994:160), cited by Sandler & Lillo-Martin (2006:409), are accompanied by eye widening and a particular pattern of head movement, but not brow raise.

- (20) ‘Base-generated topic’  
*VEGETABLE*, JOHN LIKE CORN  
 ‘As for vegetables, John likes corn.’

By encoding a particular type of topic, eye widening and head movement arguably provide the processor with the information it needs to avoid a misanalysis, thereby obviating the need for brow raise.

*Sentential subjects.* A different type of challenge awaits the processor in sentences such as (21), in which the matrix clause has a sentential subject.

- (21) br                      br  
 BILL KNOW MARY NOT^NECESSARY (=W&P’s (9) & (47))  
 ‘As for Bill, that Mary knows him is not necessary.’  
 ‘As for Bill, that he knows Mary is not necessary.’

Without brow raise, the processor would initially misanalyze BILL KNOW MARY as a subject–verb–object main clause, creating a classic garden path. Once again, brow raise intervenes, warning the processor against premature commitment to a tempting but incorrect interpretation.

*Sentence-initial clausal adjuncts.* A parallel problem arises in the case of clausal adjuncts such as the ‘if clause’ in (22), which, as Coulter (1978:68) notes, is not structurally distinct from a topic construction.

- (22) br  
 RAIN TOMORROW, WE CAN GO-TO MOVIES. (=W&P’s (10))  
 ‘If it rains tomorrow, we can go to the movies.’

Without brow raise, the processor could easily end up analyzing RAIN TOMORROW as the main clause, once again entering a garden path.

*Wh clefts.* Brow raise is also called for in the *wh* cleft pattern exemplified by (23).

- (23) br  
 MARY KNOW [SUSAN BUY WHAT, NEW SUIT] (=W&P’s (46))  
 ‘Mary knows that what Susan bought was a new suit.’

Because ASL permits an *in situ* strategy for *wh* questions (that is, the *wh* word may remain in the position normally associated with its grammatical relation), the processor's default response to a *wh* word in post-verbal position should be to posit a direct object *wh* question—a misanalysis in the case at hand. Consistent with the hypothesis that we have put forward, the brow raise marker in (23) warns against this response, allowing the processor to avoid committing to an incorrect analysis.

*Head-internal relative clauses.* ASL relative clause patterns present the processor with classic garden path perils. A prototypical example of this comes from sentences such as (24), with a head-internal relative clause in subject position of the matrix clause.

- (24)  $\frac{\text{br}}{\text{[DOG CHASE CAT] BARK (=W\&P's (52))}}$   
 'The dog that chased the cat barked.'

The processor's default response to an NP V NP string should be to posit a canonical main clause interpretation—'The dog is chasing the cat.' This misinterpretation, with its associated processing cost, is avoided in (24) thanks to brow raise.

*Head-external relative clauses.* Potential interpretive difficulties also arise in the case of externally headed relative clauses such as those exemplified below.

- (25) Head-external relative clause:  
 $\frac{\text{br}}{\text{{}_1\text{ASK}_3 \text{GIVE}_1 \text{DOG [ [URSULA KICK] THAT ] (=W\&P's (53))}}$   
 'I asked him to give me the dog that Ursula kicked.'

- (26) Extraposed head-external relative clause:  
 $\frac{\text{br}}{\text{DOG BITE}_1 \text{ [ [CHASE CAT BEFORE] THAT ] (=W\&P's (54))}}$   
 'The dog bit me [that chased the cat before].'

The key clue to the identification of the relative clauses in these patterns comes from the complementizer THAT, which is obligatory, but is not encountered until the end of the relative clause. In the meantime, of course, a variety of arguably more common interpretive options are available, including (for instance) the possibility that (26) consists of conjoined main clauses ('The dog bit me and chased the cat'). Brow raise warns against a premature commitment to such interpretations.

### 3.3.2 *Brow raise and the structure of NPs*

Thus far we have focused our attention on the default informational and structural properties of clauses. However, NPs too presumably have such properties. For the sake of exposition, let us assume that their default form is (DET) N (roughly consistent with MacLaughlin 1997) and that their default semantic function is to support reference to the individual, or set of individuals, picked out by those constituents. An interesting departure from the default case arises when focus operators come into play.

*Focus operators in pre-nominal and post-nominal position.* Focus operators such as *only*, *even* and *too* have a major impact on the interpretation of the NPs with which they are associated, requiring computation of a so-called ‘contrast set’. Whereas the sentence *John and Mary left* is true if and only if the individuals named John and Mary have in fact departed, the sentence *Only John and Mary left* must meet two conditions in order to be true—John and Mary (the focus set) must have left, AND (normally) at least one other person (the contrast set) must still be present. The focus operator *even* introduces a still subtler assumption—*Even John and Mary left* forces us to suppose not only the presence of people other than John and Mary (the contrast set again), but that, of those present, John and Mary not only left, but were the least likely to have done so.

Focus operators in ASL can appear either before or after the noun with which they are associated. When they appear in pre-nominal position, the processor is able to carry out the appropriate contrast set computations immediately upon encountering the noun. Under such circumstances, there is no brow raise.

- (27) ONLY-ONE KIM GET-A (=W&P’s (56))  
 ‘Only Kim got an A.’

Matters are different when the focus operator occurs in post-nominal position: in such cases, the processor will initially compute an interpretation for the noun without reference to a contrast set and then have to revise it upon encountering the focus operator. Interestingly, ASL employs brow raise in this case.

- (28) br  
 KIM ONLY-ONE GET-A. (=W&P’s (55))  
 ‘Only Kim got an A.’

Once again, we see brow raise put to a familiar use, warning the processor against a premature commitment to a compelling but inappropriate default analysis.

### 3.3.3 *Brow raise and modality*

As noted earlier, I adopt the uncontroversial assumption that from an informational perspective the default sentence type expresses a positive realis



indication that the predication is nullified (the property of being a doctor should not be attributed to John).<sup>5</sup> In contrast, the pattern in (30b) offers no such early clue—tempting the processor to proceed with a positive interpretation, especially since sentence-final negation is a marked option reserved for emphasis and focus (Wilbur & Patschke 1999:10, Wood 1999). The presence of brow raise can avert an early and incorrect commitment to the positive interpretation.

*Sentence-final modals.* A parallel phenomenon arises in the expression of modality, illustrated in patterns such as (31).

- (31) br  
 BILL THINK MARY BECOME DOCTOR SHOULD (=W&P's (36))  
 'Bill thinks that Mary *should* become a doctor.'

Without brow raise, a processor that is primed to build default interpretations would incorrectly commit to the realis reading at the verb BECOME—only to have to revise that interpretation upon encountering the modal at the end of the sentence.

#### 3.3.4 Making sense of brow raise

In sum, I have proposed that the principal role of brow raise in ASL is to facilitate processing by preventing the overuse of default parsing routines in the course of incremental (sign by sign) sentence interpretation. It is important to distinguish this role from that of disambiguation: brow raise warns against early interpretive action, but it does not actually stipulate the eventual correct interpretation. Brow raise on a sentence-initial NP signals that it is not a simple referential subject, but does not indicate whether it should be interpreted as a discourse topic, a contrastive topic, or the target of a subsequent focus operator. Likewise, brow raise on an NP V NP string such as DOG CHASE CAT warns against interpreting it as a canonical main clause, but does not indicate whether it will turn out to be a head-internal relative clause ('the dog that chased the cat'), a sentential adjunct ('if the dog chases the cat'), or a sentential subject ('(the fact) that the dog chased the cat').

Consistent with its cautionary function, however, brow raise typically ceases at the point where the information needed for the right interpretation becomes available, thereby highlighting the cue that the processor needs in order to proceed in an efficient manner. This is illustrated in (32), with an arrow (right after the cessation of brow raise) marking the sign that is crucial to the correct interpretation of the preceding portion of the sentence.

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<sup>5</sup> A question remains, however: why does this indication not appear even earlier, at the beginning of the sentence?

(32) The highlighting function of brow raise.

a. Head-external relative clause:

\_\_\_\_\_ br     ↓  
 1ASK3 GIVE1 DOG [[URSULA KICK] THAT]  
 ‘I asked him to give me the dog that Ursula kicked.’

b. Sentence-final negation

\_\_\_\_\_ br     ↓  
 JOHN DOCTOR NOT.  
 ‘It’s not the case that John is a doctor.’

c. Post-nominal focus

\_\_\_\_\_ br     ↓  
 KIM ONLY-ONE GET-A.  
 ‘Only Kim got an A.’

d. Topicalization

\_\_\_\_\_ br     ↓  
 MARY, JIM LOVE TEASE.

In the case of a head-external relative clause, the processor encounters the complementizer THAT, a marker of relativization. In the case of a sentence with a postposed negative, it comes upon NOT, which nullifies the predication. In the case of NP focus, an operator such as TOO or EVEN makes its appearance, introducing a contrast set into the interpretation of the NP. In the case of topicalization, a second NP shows up, confirming that the first nominal is not the subject. And so on.

Sentences create interpretive problems only for those who perceive them; speakers and signers know what they intend to say. Fortuitously for perceivers, speech carries clues about the speaker’s intended interpretation. A very obvious example of this in spoken language comes from prosody: the intonational break after the first verb in a sentence such as (33) provides a clear signal that the speaker is not including *a mile* in the VP headed by *run*, however common that association may be. (# = intonational break)

(33) If you run # a mile can be a long way.

Brow raise resembles intonation in this regard, as Sandler & Lillo-Martin (2006:415) also note. Like intonation, brow raise tells the processor when to suppress its propensity to analyze the input in accordance with previously established default routines. Intonational phrasing signals that *run a mile* does not



form a clause in (33), just as brow raise warns against a clausal analysis for DOG CHASE CAT in (34)

- (34)  $\frac{\quad}{\text{br}}$   
 [DOG CHASE CAT] BARK  
 ‘The dog that chased the cat barked.’

Intonation breaks and brow raise ‘externalize’ the sentence-building processing in ways that facilitate their interpretation.

A final issue deserves comment before concluding. An impediment to evaluating the proposal I have made is that, at least to date, relatively little is known about how sign languages are processed, even when there is no danger of a garden path effect. We are thus in roughly the same situation that held for early work on the processing of spoken language: at the time when Kimball (1973) and Fodor (1978) made their early (and ultimately very telling) observations about garden path effects in English, virtually nothing was known about the real-time processing of speech.

The key question is thus not whether the sort of proposal I have put forward can be immediately verified based on previously established facts, but rather whether it makes predictions that can be pursued empirically. One such prediction seems particularly straightforward: just as a spoken language that is produced without prosody (as in the case of writing) is more susceptible to garden path effects, so sign language stripped of brow raise should be more difficult to process in the key cases we have been discussing. Thus, to take an obvious example, a sentence containing a head-internal relative clauses pattern such as the one in (34) above should lead to a processing slowdown at BARK if there is no brow raise on the preceding string of words.

- (35) Head-internal relative clause pattern without brow raise: *DOG CHASE CAT* will initially be interpreted as a main clause, leading to processing breakdown at the second verb.

↓  
 [DOG CHASE CAT] BARK  
 ‘The dog that chased the cat barked.’

Parallel predictions can be made for the other patterns we have been considering.

#### 4. Concluding remarks

The central question addressed by this paper has not been whether ASL (and other sign languages) have ‘rules.’ Of course, they do. The real question has to do with what those rules are and how they work.

Following a rich analytic tradition in the study of spoken language, it has become common to assume that sign language is best described with reference to the abstract principles and representations of UG-based syntactic theory. This assumption requires scrutiny—not because sign language is fundamentally different from spoken language, but because the UG thesis may be wrong for spoken language. If in fact a simple efficiency-driven processor lies at the heart of the human language faculty, then it makes sense to look for its effects in the syntax of sign just as we do in the syntax of spoken languages.

No single argument or fact can possibly establish the correctness of the emergentist thesis for either spoken language or sign language. Rather, what is called for is a careful examination of individual phenomena that have been used to make the case for formal syntax, with a view to determining whether their properties can be understood in a fundamentally different way. This is exactly what we have attempted to do here with the phenomenon of ‘brow raise.’

A widely acknowledged core communicative device in ASL, brow raise is manifested in a wide spectrum of seemingly disparate situations, ranging from *yes-no* questions to relative clauses. The search for a unified account of its function initially led to an idea exploiting a highly abstract configurational property—occurrence of the target phrase in the specifier position of a phrase headed by a [-wh] operator.

In contrast, my account traces brow raise to a fundamental feature of the processor—its aversion to backtracking. On this view, the principal function of brow raise is to warn interlocutors against premature commitment to an interpretation that would ultimately lead to a processing mistake. The examples we have considered offer repeated illustrations of this: a sign or string of signs that would otherwise be incorrectly interpreted as part of a subject–verb–X realis declarative main clause is accompanied by brow raise, allowing the processor to avoid a default interpretation that would ultimately fail.

This proposal then is just another way of addressing the central explanatory questions of linguistic inquiry—why do languages have the particular properties that they do, and how are those properties acquired with relative ease by children? The answers that I offer have their foundation in processing considerations: ASL uses brow raise in the way that it does in order to facilitate processing, and children quickly acquire this convention because processing facilitation lightens the burden on comprehension for them, just as it does for adults.

It is important to acknowledge of course that brow raise is just one of many phenomena for which abstract principles and representations have been posited in the literature on sign language. Even though caution is therefore called for in drawing general conclusions, the fact that a core phenomenon in ASL lends itself to a processing-based emergentist account is suggestive. At the very least, it raises the possibility that other sign phenomena merit reconsideration as well, opening the door to possible new insights into the nature of sign language and, indeed, of language in general.

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