23

LOGICAL VISIBILITY AND ICONICITY IN SIGN LANGUAGE SEMANTICS

Theoretical perspectives

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23.1 Introduction

We argue that sign languages have a crucial role to play in the foundations of semantics, for two reasons. First, in some cases sign languages provide overt evidence on crucial aspects of the Logical Form of sentences, ones that must be inferred indirectly in spoken language (= 'Logical Visibility'). Second, along one dimension, sign languages are strictly more expressive than spoken languages because iconic phenomena can be found at their logical core (= 'Iconicity'). From this perspective, spoken language semantics is along some dimensions a 'simplified' version of sign language semantics, one from which the iconic component has been mostly lost (for background, see also Zucchi (2012)). While one may conclude that the full extent of Universal Semantics can only be studied in sign languages, an alternative is that spoken languages have comparable expressive resources, but only when co-speech gestures are taken into account – hence the need for a precise semantics for gestures as well.

We state our hypothesis of Logical Visibility in 1 (see also Lillo-Martin & Klima (1990) and Wilbur (2003, 2008), among others).

(1)   *Hypothesis 1: Logical Visibility*[1]
       Sign languages can make overt some mechanisms which (i) have been posited in
       the analysis of the Logical Form of spoken language sentences, but (ii) are not
       morphologically realized in spoken languages.

Examples will involve in particular (i) covert variables that have been posited to disambiguate relations of binding in spoken language, and are realized as loci in sign languages; and (ii) covert operations of context shift, which have been argued to be useful to analyze the behavior of indexicals in some spoken languages, and are realized as role shift in sign languages.[2]

We state our hypothesis about Iconicity in (2) (see Schlenker (2018: 129); for reference to iconic views, see Cuxac (1999), Taub (2001), Liddell (2003), Kegl (2004) and Cuxac & Sallandre (2007)).

(2) *Hypothesis 2: Iconicity*
     Sign languages make use of expressions that simultaneously have a logical/
     grammatical function and an iconic semantics, defined as a semantics in which
     some geometric properties of signs must be preserved by the interpretation
     function.

Examples will primarily involve sign language loci, which can simultaneously fulfill the role of variables and display pictorial/diagrammatic properties. Here too, we will not claim that iconic effects do not exist in spoken languages, but we will suggest that the richness of iconicity in sign languages and its seamless integration to the logical engine of the language raise particular challenges.

23.2 Logical Visibility I: visible variables

We start our discussion of Logical Visibility with sign language loci, which were analyzed by several researchers (starting with Lillo-Martin & Klima (1990)) as the overt manifestation of logical variables. We lay out this hypothesis in Section 23.2.1, illustrate it in the case of individual-referring loci in Section 23.2.2, trace some of its consequences for debates about the existence of time and world variables in Section 23.2.3, and then step back in Section 23.2.4 to ask how strong the analogy between loci and variables really is. (We leave out 'dynamic variables' from the present discussion; they are discussed at greater length in Schlenker (2011b, 2018).)

23.2.1 Variable Visibility

Sentences such as (3a) and (4a) can be read in three ways, depending on whether the embedded pronoun is understood to depend on the subject, on the object, or to be deictic.

(3) a. $Sarkozy_i$ told $Obama_k$ that $he_{i/k/m}$ would be re-elected.
     b.   Sarkozy λi Obama λk t_i told t_k that $he_{i/k/m}$ would be re-elected.

(4) a.   [A representative]$_i$ told [a senator]$_k$ that $he_{i/k/m}$ would be re-elected.
     b.   [a representative]$_i$ λi [a senator]$_k$ λk t_i told t_k that $he_{i/k/m}$ be re-elected.

These ambiguities have been analyzed in great detail in frameworks that posit that pronouns have the semantics of variables, which may be bound by a quantifier, or left free – in which case they receive their value from an assignment function provided by the context. For instance, in the textbook analysis of Heim & Kratzer (1998), one way to represent the ambiguity of (3a) is through the representation in (3b), where a *bona fide* Logical Form would be obtained by choosing the index *i*, *k*, or *m* for the pronoun *he* (since the subject and object are referring expressions, there are several alternative

ways to represent the ambiguity). (4b) summarizes three possible Logical Forms of (4a) within the same framework, depending on whether *he* is given the index *i*, *k*, or *m*.

Sometimes these representations can get quite complex, for instance to capture the fact that plural pronouns may be simultaneously bound by several quantifiers, as in (the relevant reading of) (5a), represented as in (5b).

(5) a. [A representative]$_i$ told [a senator]$_k$ that they$_{i, k}$ would (both) be re-elected.
     b. [a representative]$_i$ λi [a senator]$_k$ λk t$_i$ told t$_k$ that they$_{i+k}$ would be re-elected.

In this case, it is essential on the relevant reading that *they* should be simultaneously dependent on *a representative* and on *a senator,* hence the 'sum' index *i+k* that appears on *they* in (5b).

In this section, we survey recent results that suggest that sign languages display an overt version of something close to the indices of (3)–(5), and that this fact can be used to revisit some foundational questions in semantics. However, it will prove useful to distinguish between two versions of this hypothesis of 'Variable Visibility' (Schlenker 2018). According to the weak version (6a), it is possible to associate both to a pronoun and to its antecedent a symbol (namely a locus) that marks their dependency, and to associate to different deictic pronouns different symbols if they denote different objects. According to the strong version (6b), the symbols in question – loci – really do display the behavior of variables – which, as we will see below, is a strictly stronger (and possibly overly strong) claim.

(6) *Variable Visibility*
     a. Weak version
         In sign languages, a given locus in signing space can be associated both to a pronoun and to its antecedent to mark their dependency. Furthermore, deictic pronouns that refer to different objects may be associated to different loci.
     b. Strong version
         In sign languages, some uses of loci display the behavior of logical variables, both in their bound and in their free uses.

23.2.2 *Loci as variables*[3]

As mentioned, Lillo-Martin & Klima (1990) argued that logical variables or indices, which are usually covert in spoken languages, can be overtly realized in sign language by positions in signing space or 'loci'. In case a pronoun is used deictically or indexically, its locus usually corresponds to the actual position of its denotation, be it the speaker, the addressee, or some third person (e.g., Meier 2012). If the pronoun is used anaphorically, the antecedent typically establishes a locus, which is then 'indexed' (= pointed at) by the pronoun. In the American Sign Language (ASL) example in (7a), the sign names BUSH and OBAMA establish loci by being signed in different positions; in (7b), the antecedent noun phrases are accompanied with pointing signs that establish the relevant loci. In quantificational examples, indexing disambiguates among readings, as in (8) from French Sign Language (LSF). (Note that throughout, translations are followed by the references of the target videos.)

(7) a. IX-1 KNOW BUSH_a IX-1 KNOW OBAMA_b. IX-b SMART BUT IX-a NOT SMART.
'I know Bush and I know Obama. He [= Obama] is smart but he [= Bush] is not smart.' (ASL; 4, 179)

b. IX-1 KNOW PAST PRESIDENT IX-a IX-1 KNOW NOW PRESIDENT IX-b.
IX-b SMART BUT IX-a NOT SMART.
'I know the former President and I know the current President. He [= the current President] is smart but he [= the former President] is not smart.'
(ASL; 4, 179)

(ASL, Schlenker 2011b: 350)

(8) DEPUTY_b SENATOR_a CL_b-CL_a IX-b a-TELL-b IX-a / IX-b WIN ELECTION
'An MP_b told a senator_a that he_a / he_b (= the deputy) would win the election.'
(LSF; 4, 233)   (LSF, Schlenker 2016: 1068)

A crucial property of sign language anaphora is that loci can be created 'on the fly' in many different positions of signing space, and that there is no clear upper bound on the number of loci that can simultaneously be used, besides limitations of performance (since signers need to be able to distinguish loci from each other, and to keep their position and denotation in memory). Now there are spoken languages in which third-person reference can be disambiguated by grammatical means, for instance by way of a distinction between proximate and obviative marking (e.g., in Algonquian languages, see Hockett (1966)) or in switch-reference systems (e.g., Finer 1985). But these only make it possible to distinguish among a small number of third-person elements – typically two or three (for instance, 'proximate', 'obviative', and sometimes 'double obviative' in obviative systems). By contrast, there seems to be an unlimited number of potential distinctions in sign language, and in this case the signed modality – and specifically the fact that loci can be realized as points in space – seems to play a crucial role in Variable Visibility.

As is well-known, when a pronoun denotes a plurality it may be realized by an 'arc' pointing sign, which thus indexes a semi-circular area; and there are also dual and even trial pronouns when the pronoun denotes two or three individuals. Strikingly, these pronouns can simultaneously index several loci in cases corresponding to the 'split antecedents' discussed in (5). Thus, in (9), the dual pronoun THE-TWO-a,b is realized as a horizontal *2* that goes back and forth between the two loci; and it can be checked that this is no accident: if the position of the loci is modified, the movement that realizes THE-TWO changes accordingly.

(9) IX-1 HAVE TWO TICKET. IF 1-GIVE JOHN_a BILL_b, THE-TWO-a,b HAPPY.
'I have two tickets. If I give them to John and Bill, they will be happy.' (ASL; 2, 180)
(ASL, Schlenker 2018: 137)

More complex cases can easily be constructed, with trial or plural pronouns indexing more than two loci.

Because there appears to be an arbitrary number of possible loci, it was suggested that these do not spell out morpho-syntactic features, but rather are the overt realization of formal indices (Lillo-Martin & Klima 1990; Sandler & Lillo-Martin 2006; we revisit this point in Section 23.2.4). Importantly, there are some striking similarities between sign

language pronouns and their spoken counterparts, which makes it desirable to offer a unified theory.[4]

The first similarity is that sign language pronouns obey at least some of the syntactic constraints on binding studied in spoken language syntax. For instance, versions of the following rules have been described for ASL (Lillo-Martin 1991; Sandler & Lillo-Martin 2006; Koulidobrova 2011; Schlenker & Mathur 2013): Condition A, which mandates that a reflexive pronoun such as *himself* co-refer with a local antecedent (e.g., *He$_i$ admires himself$_i$)*; Condition B, which prohibits a non-reflexive pronoun from overlapping in reference with a local antecedent (hence the deviance of #*He$_i$ admires him$_i$*, understood with coreference); and Strong Crossover, which prohibits a quantificational expression from moving to the left of a coindexed pronoun that c-commands its base position (hence the deviance of #*[Which man]$_i$ does he$_i$ think I will hire t$_i$*, where *t$_i$* is the base position of the interrogative expression, and *he$_i$* is coindexed with it).

The second similarity is that, in simple cases at least, the same ambiguity between strict and bound variable readings is found in both modalities (see Lillo-Martin & Sandler (2006); further cases will be discussed below); this is illustrated in 10, which has the same two readings as in English: the third person mentioned can be understood to like his mother, or the speaker's mother.[5]

(10) IX-1 POSS-1 MOTHER LIKE. IX-a SAME-1,a.
  Ambiguous: I like my mother. He does too [= like my / like his mother] (ASL; 1, 108)

(ASL, Schlenker et al. 2013: 93)

23.2.3 Individual, time and world variables[6]

We turn to the debate concerning the existence of an abstract anaphoric mechanism that applies in similar fashion to the nominal, temporal, and modal domains. In a nutshell, we suggest that ASL loci have all three uses, and thus provide an argument in favor of the existence of such an abstract system. In what follows, temporal and modal uses of loci have roughly the same meaning as the English word *then*, which has both temporal and modal uses; the crucial difference is that in ASL the very same word can have nominal, temporal and modal uses (and locative uses as well, as we will see shortly); and that it arguably 'wears its indices on its sleeves' because of the variable-like uses of loci.

The point is by no means trivial. In the tradition of modal and tense logic, it was thought that expressions are only implicitly evaluated with respect to times and possible worlds: language was thought to be endowed with variables denoting individuals, but not with variables denoting times or possible worlds. By contrast, several researchers argued after Partee (1973) and Stone (1997) that natural language has time- and world-denoting variables – albeit ones that usually manifest themselves as affixes (tense, mood) rather than as full-fledged pronominal forms. Here we make the simple suggestion that ASL pronouns in their various forms can have nominal, temporal, modal and also locative uses. The full argument has three steps:

1. As we discussed above, nominal anaphora in sign language usually involves (i) the establishment of positions in signing space, called 'loci', for antecedents; (ii) pointing

towards these loci to express anaphora. Both properties are also found in the temporal and modal domains.

2. This observation does not just hold of the singular index; temporal uses of dual, trial, and plural pronouns can be found as well. The phenomenon is thus general, and it is not plausible to posit that it is an accident that all these morphologically distinct pronouns simultaneously have nominal, temporal, and modal uses: indexing *per se* seems to have all these uses.

3. Temporal and modal anaphora in ASL can give rise to patterns of inference that are characteristic of so-called 'donkey' pronouns (i.e., pronouns that depend on existential antecedents without being in their syntactic scope).

Here, we just illustrate the first step of the argument and refer the reader to Schlenker (2013a) for further details. Let us start with *temporal indexing:* It can be seen in (11) that the same possibilities are open for temporal anaphora as were displayed for nominal anaphora in (7) and (8): antecedents establish loci; pronominal forms retrieve them by way of pointing ('re' = raised eyebrows).[7]

(11) a. [YESTERDAY RAIN]$_a$ [DAY-BEFORE-YESTERDAY SNOW]$_b$.

       <u> re </u>   <u> re </u>

       IX-b IX-1 HAPPY.   IX-a IX-1 NOT HAPPY.

       'Yesterday it rained and the day before yesterday it snowed. Then [= the day before yesterday] I was happy but then [= yesterday] I wasn't happy.' (ASL; 4, 181)

  b. [WHILE RAIN]$_a$ TEND WARM. [WHILE SNOW]$_b$ TEND COLD.

       <u> re </u>   <u> re </u>

       IX-b IX-1 HAPPY.   IX-a IX-1 NOT HAPPY.

       'When it rains it is warm but when it snows it is cold. Then [= when it snows] I am happy but then [= when it rains] I am not happy.' (ASL; 4, 182)

  c. *Context*: I went skiing during the holidays.

                                  <u> re </u>   <u> re </u>

       [SOMETIMES RAIN]$_a$ [SOMETIMES SNOW]$_b$.   IX-b IX-1 HAPPY.   IX-a IX-1 NOT HAPPY.

       'Sometimes it rained and sometimes it snowed. Then [= when it snowed] I was happy but then [= when it rained] I wasn't happy].' (ASL; 4, 195)

                                                           (ASL, Schlenker 2013a: 213f)

As can be seen, temporal indexicals, *when*-clauses (which are semantically similar to definite descriptions of times), and existential time quantifiers (*sometimes*) can all give rise to patterns of anaphora involving the same pronoun IX as in the nominal case (the existential cases involves an instance of 'dynamic binding' whose nominal counterpart is discussed at greater length in Schlenker (2011b)). Importantly, loci appear in the *usual* signing space, which is in front of the signer. Although the words for *tomorrow* and *yesterday* are signed on the 'time line', which is on a sagittal plane (*tomorrow* is signed in the front, *yesterday* towards the back), no pointing occurs towards it, at least in this case (but see Emmorey (2002) for discussion).

Let us turn to *modal indexing.* While there are no clear world indexicals or world proper names, modals such as *can* are standardly analyzed as existential quantifiers over possible worlds; and *if*-clauses have occasionally been treated as definite descriptions of possible worlds (e.g., Bittner 2001; Schlenker 2004; Bhatt & Pancheva 2006). Both cases can give rise to locus indexing in ASL, as shown in (12).

(12)   a.   TOMORROW [POSSIBLE RAIN]$_a$ [POSSIBLE SNOW]$_b$.

                <u> re </u>   <u> re </u>

                IX-b IX-1 HAPPY.   IX-a IX-1 NOT HAPPY.

                'Tomorrow it might rain and it might snow. Then [= if it snows] I'll be happy. Then [= if it rains] I won't be happy.' (ASL; 4, 183)

    b.   [IF RAIN TOMORROW]$_a$ WILL WARM. [IF SNOW TOMORROW]$_b$ WILL COLD.

                <u> re </u>   <u> re </u>

                IX-b IX-1 HAPPY.   IX-a IX-1 NOT HAPPY.

                'If it rains tomorrow it will be warm, but if it snows tomorrow it will be cold. Then [= if it snows] I'll be happy. Then [= if it rains] I won't be happy.'
(ASL; 4, 183)

                                                        (ASL, Schlenker 2013a: 215f)

We conclude that explicit anaphoric reference to times and possible worlds is possible in ASL – though our analysis leaves it entirely open whether times and worlds should be primitive types of entities in our ontology or should be treated as varieties of a more general category of *situations*.

23.2.4 *Variables or features – or both?*[8]

We take examples such as (7)–(9), as well as much of the foregoing discussion, to have established the plausibility of the Weak Hypothesis of Variable Visibility in (6a): a given locus may be associated both with a pronoun and to its antecedent to mark their dependency; furthermore, deictic pronouns that refer to different objects may be associated with different loci. But this does not prove that loci share in all respects the behavior of logical variables, and thus these facts do not suffice to establish the Strong Hypothesis of Variability in (6b).

This stronger hypothesis was recently challenged by Kuhn (2015), who argues that loci should be seen as features akin to person and gender features, rather than as variables. On a positive level, Kuhn argues that the disambiguating effect of loci in (7) to (9) can be explained if loci are features that pronouns inherit from their antecedents, just as is the case of gender features in spoken languages (and it is uncontroversial that these are not variables). On a negative level, Kuhn argues that treating loci as variables predicts that they should obey two constraints that are in fact refuted by his ASL data.

First, a variable is constrained to depend on the structurally closest operator it is coindexed with. Thus, the boxed variable x_1 in (13a) cannot be semantically dependent on the universal quantifier $\forall x_1$ because of the intervening quantifier $\exists x_1$ – by contrast with (13b), where the intervening quantifier carries a different index. For the same reason, the boxed variable in both formulas cannot be free and refer (deictically, in linguistic parlance) to a fixed individual.

(13)   Variable capture in First-Order Logic:

      $\boxed{x_1}$ can be bound by $\forall x_1$ in b. but not in a.

      a. $\forall x_1 \, \exists x_1 \, \dots \, P\,\boxed{x_1}\dots$

      b. $\forall x_1 \, \exists x_2 \, \dots \, P\,\boxed{x_1}\dots$

By the same token, the two occurrences of the variable x_1 in (14) must have the same semantic value – in particular, if no quantifier binding x_1 appears at the beginning of the formula, both occurrences will be free and will denote a fixed individual.

(14) Variable re-use in First-Order Logic:
 The two occurrences of x_1 must denote the same object.
 … Px_1 & Qx_1 …

Kuhn (2015) argues that both predictions are incorrect: first, expected cases of variable capture fail to arise under the quantificational adverb *only*; second, multiple occurrences of the same locus may refer to different individuals. For brevity, we only discuss the second problem here (see Schlenker (2016) for the first problem). Kuhn shows that in (15), a single locus is assigned to John and Mary, and another locus is assigned to Bill and Suzy. As a result, the boxed occurrences IX-a and IX-b refer to John and Mary respectively, while the underlined pronouns ɪx-a and ɪx-b refer to Mary and Suzy. (Note that in this example, and some of the examples to follow, the number preceding the gloss ('6' in this case) represents the (average) rating of the example on a 7-point scale by one or more informants, with 7 being the highest rating.)

(15) 6 EVERY-DAY, JOHN$_a$ TELL MARY$_a$ IX-a LOVE ɪx-a.
 BILL$_b$ NEVER TELL SUZY$_b$ IX-b LOVE ɪx-b.
 'Every day, John$_i$ tells Mary$_j$ that he$_i$ loves her$_j$.
 Bill$_k$ never tells Suzy$_l$ that he$_k$ loves her$_l$.' (ASL, Kuhn 2016: 464)

As Kuhn observes, this example is problematic for the variable-based view. The initial association of the proper name JOHN with variable a should force a to refer to John; but then how can a also refer in the same clause, and without any intervening binder, to Mary? By contrast, these data are unproblematic for the feature-based analysis of loci: just like two noun phrases may bear the same feminine gender features while denoting different individuals, so it is with loci-as-features. Locus re-use is certainly limited by pragmatic or other constraints – a more standard strategy is to assign one locus per individual. Kuhn's argument is really an existential proof that in *some* cases, loci display a behavior which is incompatible with the view that they spell out variables. Two directions have been explored to solve these problems.

On the one hand, Kuhn treats loci as features which are not interpreted (so that neither the problem of variable capture nor the problem of variable re-use can arise in the first place), but are inherited by a mechanisms of morpho-syntactic agreement; this allows him to provide a variable-free treatment of loci, which is developed in great detail in Kuhn (2016) (as Kuhn observes, the fact that loci are not variables does not show that there are no variables in the relevant Logical Forms, just that loci are not them; giving a variable-free treatment of these data is thus a possibility but certainly not a necessity).

Schlenker (2016), on the other hand, suggests instead that loci may both display the behavior of variables and of features – they are thus 'featural variables'. Specifically, when they are interpreted, their semantics is given by an assignment function, just like that of standard indices. But they may be disregarded in precisely the environments in which person or gender features can be disregarded. Furthermore, in many environments, loci constrain the value of covert variables.

23.3 Logical Visibility II: beyond variables

In this section, we turn to further cases – not related to loci – in which sign language makes overt certain parts of Logical Forms that are usually covert in spoken language. The first case involves context-shifting operators, which were argued in semantic research to be active but covert in spoken language (e.g., Schlenker 2003; Anand & Nevins 2004; Anand 2006). Following Quer (2005), we propose that context shift can be realized overtly in sign language, by way of an operation called 'role shift'. We then move to the aspectual domain and summarize results which suggest that some primitive categories in the representation of aspectual classes are made visible in sign language but are usually covert in spoken language (the 'Event Visibility Hypothesis' of Wilbur (2003)).

23.3.1 Role shift as visible context shift[9]

23.3.1.1 Basic data

Two strands of research on context-dependency have come together in recent years. In the semantics of spoken languages, considerable attention has been devoted to the phenomenon of context shift, as evidenced by the behavior of indexicals. While these were traditionally thought to depend rigidly on the context of the actual speech act (Kaplan 1989), it turned out that there are languages and constructions in which this is not so: some attitude operators appear to be able to 'shift the context of evaluation' of some or all indexicals (e.g., Schlenker 1999, 2003, 2011c; Anand & Nevins 2004; Anand 2006). In research on sign languages, there has been a long-standing interest in role shift, an overt operation (often marked by body shift and/or eyegaze shift) by which the signer signals that she adopts the perspective of another individual (e.g., Padden 1986; Lillo-Martin 1995; Sandler & Lillo-Martin 2006; see also Steinbach, Chapter 16). Role shift comes in two varieties: it may be used to report an individual's *speech or thought* – henceforth 'Attitude Role Shift'. Or it may be used to report in a particularly vivid way an individual's *actions* – henceforth 'Action Role Shift' (a more traditional term in sign language research is 'Constructed Action').

Quer (2005) connected these two strands of research by proposing that Attitude Role Shift is overt context shift. His main motivation was that some or all indexicals that appear in its scope acquire a shifted interpretation. For such an argument to be cogent, however, an alternative analysis must be excluded, one according to which the role-shifted clause is simply quoted – for quoted clauses are arguably mentioned rather than used, which obviates the need to *evaluate* their content relative to a shifted context.[10] Quer's argument is in two steps (2005, 2013). First, he shows that some indexicals in Attitude Role Shift in Catalan Sign Language (LSC) have a shifted interpretation, i.e., are intuitively evaluated with respect to the context of the reported speech act. Second, he shows that in some of these cases clausal quotation cannot account for the data because other indexicals can be evaluated with respect to the context of the actual speech act. This pattern is illustrated in (16), where the first-person pronoun IX-1 is evaluated with respect to the reported context (and thus refers to Joan), while HERE is evaluated with respect to the actual context.

	t		RS-i

(16)   IX$_a$ MADRID$_m$ MOMENT JOAN$_i$ THINK IX-1$_i$ STUDY FINISH HERE$_b$

‘When he was in Madrid, Joan thought he would finish his study here (in Barcelona).’

(LSC, Quer 2005: 154)

As emphasized by Quer (2013), it is also possible to understand HERE as being shifted; but the reading with a ‘Mixing of Perspectives’ found in (16) is crucial to argue that there is context shift rather than standard quotation.[11]

23.3.1.2 *Typology: ‘Mixing of Perspectives’ vs. ‘Shift Together’*

In order to account for his data, Quer (2005) makes use of a framework developed in Schlenker (2003), in which attitude operators could bind object-language context variables, with the result that a given embedded clause could include both shifted and shifted indexicals. In Schlenker (2003), the argument for this possibility of a ‘Mixing of Perspectives’ came from preliminary Amharic data, as well as data from Russian. Schematically, Schlenker (2003) posited Logical Forms such as those in (17), where an attitude verb binds a context variable c, while a distinguished variable $c*$ denoting the actual speech act remains available for all indexicals. As a result, when two indexicals *indexical$_1$* and *indexical$_2$* appear in the scope of an attitude verb, they may be evaluated with respect to different context variables, as is illustrated in (17).

(17)   ‘Mixing of Perspectives’ in Schlenker (2003):
  … attitude-verb$_c$ …   indexical$_1$(c) …   indexical$_2$(c*) …
  … attitude-verb$_c$ …   indexical$_1$(c*) …   indexical$_2$(c) …
  … attitude-verb$_c$ …   indexical$_1$(c) …   indexical$_2$(c) …
  … attitude-verb$_c$ …   indexical$_1$(c*) …   indexical$_2$(c*) …

While agreeing that some attitude verbs are context shifters, Anand & Nevins (2004) and Anand (2006) argued that ‘Mixing of Perspectives’ is undesirable. Specifically, they showed that in Zazaki, an Indo-Aryan language of Turkey, if an indexical embedded under an attitude verb receives a shifted reading, so do all other indexicals that are found in the same clause – a constraint they labeled ‘Shift Together’:

(18)   ‘Shift Together’ (Anand & Nevins 2004):
  If an indexical is shifted in the scope of a modal operator, all other indexicals in the same clause must be shifted as well.

  … attitude verb … δ [… shifted indexical$_1$ … . shifted indexical$_2$ …]

For Anand & Nevins (2004) and Anand (2006), a covert context-shifting operator is optionally present under the verb *say* in Zazaki, but crucially it does not bind context variables, and just manipulates an implicit context parameter. When the operator is absent, the embedded clause behaves like an English clause in standard indirect discourse. When the context-shifting operator is present, it shifts the context of evaluation of *all* indexicals within its scope – hence the fact that we cannot ‘mix perspectives’ within the embedded clause. This is schematically represented in (19):

(19) 'Shift Together' in Anand & Nevins (2004) and Anand (2006):
      … attitude-verb   … indexical$_1$ … indexical$_2$ …   => neither indexical is shifted
      … attitude-verb Op   … indexical$_1$ … indexical$_2$ …   => both indexicals are shifted

While the initial debate was framed as a choice between two competing theories of context shift, an alternative possibility is that different context-shifting constructions pattern differently in this connection (e.g., with Zazaki going with 'Shift Together', and Russian and Amharic with 'Mixing of Perspectives'). The sign language data that have been explored thus far argue for this ecumenical view: some languages allow for 'Mixing of Perspectives', while others obey 'Shift Together'. Arguing for 'Mixing of Perspectives', the data from LSC in (16) mirror the Russian data in that two indexicals that appear in the same clause may be evaluated with respect to different contexts. Similarly, German Sign Language (DGS) allows for 'Mixing of Perspectives', with a shifted indexical co-existing with an unshifted one in the same clause (Herrmann & Steinbach 2012; Hübl & Steinbach 2012; Quer 2013). Arguing for 'Shift Together', Schlenker (2017b, 2017c) shows that ASL and LSF replicate the Zazaki pattern: under role shift, all indexicals are obligatorily shifted. A case in point is displayed in (20), where the first-person pronoun IX-1 and the adverb HERE are both signed under role shift, and both are obligatorily interpreted with a shifted meaning.

(20) *Context:* the speaker is in NYC

$$\overline{\qquad\qquad\qquad\text{RS}_a\qquad\qquad\qquad}$$

      7   IN LA WHO IX-a JOHN$_a$ SAY   IX-1 WILL MEET HERE WHO
      'In LA, who did John say he would meet there [in LA]?' (ASL; 6, 293; 6, 316)
      Informant JL (on a video on which he signed the sentence [ASL, 6, 316]):
      7, HERE = LA
      Informant 2 (on a video on which he signed the sentence with IX-b replacing
      IN [ASL; 6, 293]): 7, HERE = preferably LA [ASL; 6, 294–295].[12]

      (ASL, Schlenker 2017b)

In sum, given the available data, it seems that the typology of context-shifting operations in sign language mirrors that found in spoken language: some languages/constructions obey 'Shift Together', whereas others allow for 'Mixing of Perspectives'. The difference between the two modalities is, of course, that in sign language role shift is overtly realized.

23.3.1.3 Further complexities

While this basic picture of role shift as overt context shift is appealingly simple, it abstracts away from important complexities.

First, role shift does not just occur in attitude reports (= 'Attitude Role Shift'), but it can also be used in action reports, especially to display in a particularly vivid fashion some parts of the action through iconic means (= 'Action Role Shift'). Attitude Role Shift can target an entire clause, as well as any indexicals within it (optionally or obligatorily depending on the language). By contrast, Action Role Shift is more constrained; depending on the author, in ASL it is believed to just target verbs (Davidson 2015), or possibly larger constituents, but if so, only ones that contain no indexicals or first-person

agreement markers (Schlenker 2017b). Be that as it may, any context-shifting analysis of role shift must be extended in non-trivial ways to account for Action Role Shift (for a proposal, see Schlenker (2017b)).

Second, it is not clear that ASL and LSF role shift cannot be analyzed in terms of quotation. Indexicals will not help, since the data mentioned above seem to argue that all indexicals are evaluated with respect to the same perspectival point, which is also what one would expect in standard quotation. In spoken languages, a standard strategy to disprove a quotational analysis of a clause under *say* is to establish a grammatical dependency between the embedded clause and the matrix clause – with the assumption that 'grammatical dependencies do not cross quotation marks' (presumably because quoted material is mentioned, not used). Thus, quotation is impossible in (21) and (22) because of a grammatical dependency between the quoted clause and the matrix clause, involving a moved interrogative expression ('*wh*-extraction') in (21) and a dependency between a Negative Polarity Item (NPI) and its negative licenser in (22).

(21)   * What did Mary say: 'I understand _'?

(22)   * Mary didn't say: 'I understand any chemistry'.

Now in the data reported in Schlenker (2017b, 2017c), ASL role shift allows for *wh*-extraction out of role-shifted clauses, but so does another construction that is plausibly quotational (because it involves a sign for quotation at the beginning of a non-role-shifted clause). For this reason, the evidence that the role-shifted clause does not involve quotation is weak – maybe quotation just does allow for *wh*-extraction in our ASL data, for unknown reasons. Furthermore, another standard test of indirect discourse fails; it involves the licensing of a Negative Polarity Item, ANY, by a negative element found in the matrix clause. When the embedded clause is in standard indirect discourse, 'any' can be licensed by a matrix negation both in the English sentence in (23a), and in an analogous sentence in ASL. When the clause is quoted, as in the English example in (23b), 'any' cannot be licensed from by a negation in the matrix clause. Crucially, an analogous sentence with role shift in ASL displays a pattern similar to (23b), which suggests that Attitude Role Shift does have a quotational component.

(23)   a.   John never said he showed Mary any kindness.
       b.   # John never said: 'I showed Mary any kindness'.

In addition, in LSF *wh*-extraction out of role-shifted clause fails, just as it fails out of a quoted sentence in the English data in (21a); this too suggests that Attitude Role Shift has a quotational component. Thus, in ASL and LSF, the argument that role shift involves context shift rather than quotation depends rather heavily on the existence of Action Role Shift, which could not be analyzed in quotational terms (because it is used to report actions rather than thought- or speech-acts). By contrast, in LSC and DGS, the argument against a quotational analysis is fairly strong due to the ability of role-shifted clauses to mix perspectives.

Finally, Schlenker (2017b, 2017c), following much of the literature, argues that role shift comes with a requirement that some elements be interpreted iconically (and suggests that the quotational effects discussed in (ii) above are a special case of iconicity). We come back to this point in Section 23.5.3.

23.3.2 Aspect: visible event decomposition

Cases of Visibility are not limited to the domains of reference (as in Section 23.2) and context-dependency (as in Section 23.3.1). Wilbur (2003) argued that sign language makes visible certain parts of the logical structure of verbs – and coined the term 'Event Visibility' to label her main hypothesis. To introduce it, a bit of background is needed. Semanticists traditionally classify event descriptions as *telic* if they apply to events that have a natural endpoint determined by that description, and they call them *atelic* otherwise. *Ann spotted Mary* and *Ann understood* have such a natural endpoint – the point at which *Ann* spotted Mary and came to an understanding, respectively; *Ann knew Mary* and *Ann reflected* lack such a natural endpoint and are thus atelic. Standardly (e.g., Rothstein 2004), a temporal modifier of the form *in α time* modifies telic VPs while *for α time* modifies atelic VPs (e.g., *Ann reflected for a second* vs. *Ann understood in a second*). Now Wilbur's hypothesis is that the distinction between telic and atelic predicates is often realized overtly in ASL by: (i) change of handshape aperture (open/closed or closed/open); (ii) change of handshape orientation; and (iii) abrupt stop at a location in space or contact with a body part (Wilbur & Malaia 2008).

On a theoretical level, Wilbur (2008) posits that in ASL and other sign languages, telicity is overtly marked by the presence of an affix dubbed *EndState*, which "means that an event has a final state and is telic. Its phonological form is 'a rapid deceleration of the movement to a complete stop'" (Wilbur 2008: 232) which can come in several varieties, as illustrated in (24). Remarkably, then, Wilbur's findings suggest that sign language can articulate overtly some grammatically relevant aspects of event decomposition. In Section 23.5.2, we will revisit Wilbur's Event Visibility Hypothesis, asking whether it might not follow from a more general property of structural event iconicity.

(24)   Examples of movements in signs denoting telic events (Wilbur 2008: 232; © Signum Press, reprinted with permission)

a.	change of aperture handshape change	b.	orientation change	c.	setting change proximal / distal	d.	change of location with contact
	SEND		HAPPEN		POSTPONE		HIT

23.4 Iconicity I: iconic variables

23.4.1 Introduction

In the cases we have discussed up to this point, sign language makes some aspects of the Logical Forms of sentences more transparent than they are in spoken language. In this section, we turn to cases in which sign language has greater expressive power than spoken languages because it makes greater use of iconic resources. There are certainly

iconic phenomena in spoken language, for instance in the sentence 'The talk was loooooong' (see Okrent 2002): the excessive duration of the vowel gives a vivid idea of the real or experienced duration of the talk (as one might expect, saying that 'the talk was shoooooort' would yield a rather odd effect). But sign languages make far more systematic use of iconicity, presumably because their depictive resources are much greater than those of spoken languages. While one might initially seek to separate neatly between a 'grammatical/logical' and an 'iconic' component in sign language, we will see that the two are closely intertwined: iconic phenomena are found at the core of the logical engine of sign language. In particular, we will revisit in detail the case of sign language loci, and we will argue that in some cases they are simultaneously logical variables and simplified pictures of what they denote.

23.4.2 Embedded loci: plurals[13]

The simplest instance of an iconic constraint concerns plural ASL and LSF loci, which are usually realized as (semi-)circular areas. These can be embedded within each other, and we hypothesize that this gives rise to cases of *structural iconicity,* whereby topological relations of inclusion and relative complementation in signing space are mapped into mereological analogues in the space of loci denotations.

Our initial focus is on the anaphoric possibilities made available in English by the sentence *Most students came to class*. Recent research has argued that such a sentence makes available two discourse referents for further anaphoric uptake: one corresponding to the maximal set of students, as illustrated in (25b) ('maximal set anaphora'); and one for the entire set of students, as illustrated in (25c) ('restrictor set anaphora').

(25)   a.   *Complement set anaphora:*
             #Most students came to class. They stayed home instead.
       b.   *Maximal set anaphora:*
             Most students came to class, and they asked good questions.
       c.   *Restrictor set anaphora:*
             Most students came to class. They are a serious group.

Crucially, however, no discourse referent is made available for the set of students that did not come to class ('complement set anaphora', as this is the complement of the maximal set within the restrictor set); this is what explains the deviance of (25a). This anaphoric pattern, whereby *they* in (25a) is read as referring to the students that did *not* come, is at best limited when the initial quantifier is *few,* and nearly impossible with *most.* Nouwen (2003) argues that when available, complement set anaphora involves *inferred* discourse referents: no grammatical mechanism makes available a discourse referent denoting the complement set – here: the set of students who *didn't* come.

On the basis of ASL and LSF data, Schlenker et al. (2013) made two main observations.

Observation I. When a default plural locus is used in ASL, data similar to (25) can be replicated – e.g., complement set anaphora with *most* is quite degraded. This is illustrated in (26), with average judgments (per trial) on a 7-point scale, with a total of five trials and three informants.

(26) a. POSS-1 STUDENT FEW a-CAME CLASS.
          3.6   IX-arc-a a-STAY HOME.
      b. POSS-1 STUDENT MOST a-CAME CLASS.
          2.8   IX-arc-a a-STAY HOME.
          Intended: 'Few/Most of my students came to class. They [the students that didn't come] stayed home.'   (ASL, Schlenker et al. 2013: 98)

Observation II. When embedded loci are used, the effect is circumvented: one large locus (written as *ab*, but signed as a single circular locus) denotes the set of all students; a sublocus (= *a*) denotes the set of students who came; and a complement locus (= *b*) thereby becomes available, denoting the set of students who did not come, as illustrated in (27).

(27) POSS-1 STUDENT IX-arc-ab MOST IX-arc-a a-CAME CLASS.
      'Most of my students came to class.'
      a. 7 IX-arc-b b-STAY HOME
          'They stayed home.'
      b. 7 IX-arc-a a-ASK-1 GOOD QUESTION
          'They asked me good questions.'
      c. 7 IX-arc-ab SERIOUS CLASS
          'They are a serious class.' (ASL; 8, 196)

                                        (ASL, Schlenker et al. 2013: 98)

(28)
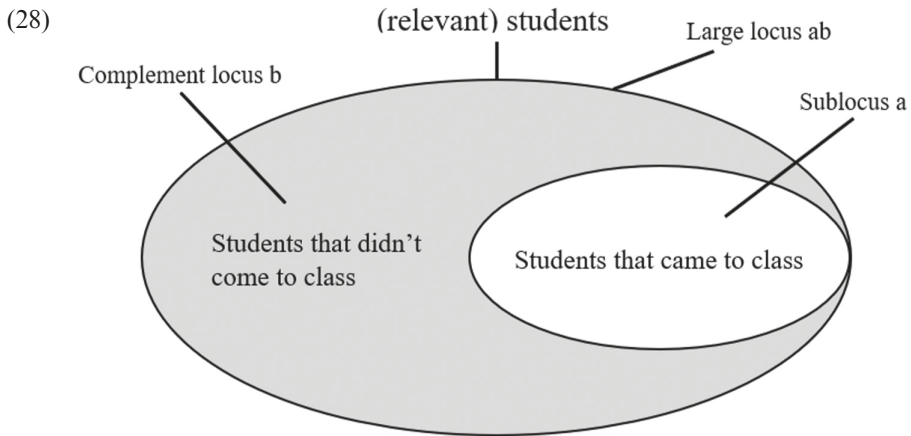
Schlenker et al. (2013) account for Observation I and Observation II by assuming that Nouwen is right that in English, as well as ASL and LSF, the grammar fails to make available a discourse referent for the complement set, i.e., the set of students who did not come; but that the mapping between plural loci and mereological sums preserves relations of inclusion and complementation, which in (27a) makes available the locus *b*.

The main assumptions are that (a) the set of loci is closed with respect to relative complementation: if *a* is a sublocus of *b,* then *(b-a)* is a locus as well; and (b) assignment

functions are constrained to respect inclusion and relative complementation: if *a* is a sublocus of *b*, the denotation of *a* is a subpart of the denotation of *b*, and *(b-a)* denotes the expected complement set. These conditions are stated more completely in (29):

(29)   Conditions on loci
       Let LOC be the set of plural loci that appear in signing space, and let s an admissible assignment function that assigns values to loci. We make the assumptions in (a) and (b), where we view plural loci as sets of geometric points, and loci denotations as sets of individuals.
       a.   Conditions on LOC: for all a, b ∈ LOC, (i) a ⊆ b or b ⊆ a or a ∩ b = Ø;
            (ii) if a ⊂ b, (b-a) ∈ LOC
       b.   Conditions on s: for all a, b ∈ LOC, (i) a ⊂ b iff s(a) ⊂ s(b);
            (ii) if a ⊂ b, s(b-a) = s(b)-s(a)   (ASL, Schlenker et al. 2013: 101)

Since it is unusual to take a symbol to be *part of* another symbol, it should be emphasized that the notation $a \subseteq b$ is to be taken literally, with the locus (and thus symbol) *a* being a subpart of the locus *b* (this can for instance be further analyzed as: the set of points *a* in signing space is a subset of the set of points *b* in signing space). The condition *a ⊂ b iff s(a) ⊂ s(b)* should thus be read as: the locus *a* is a proper subpart of the locus *b* just in case the denotation of *a* is a proper subpart of the denotation of *b*.[14]

Let us now see how the conditions on loci in (29) derive our sign language data. In (27a), where embedded loci are used, we can make the following reasoning:

- Since *a* is a proper sublocus of a large locus *ab*, we can infer by (29a-ii) that *(ab-a)* (i.e., *b*) is a locus as well;
- by (29b-i), we can infer that s(a) ⊂ s(ab);
- and by (29b-ii), we can infer that s(b) = s(ab)-s(a).

In this way, complement set anaphora becomes available because ASL can rely on an iconic property which is inapplicable in English. But this does not mean that there is a proper grammatical (non-iconic) difference between these two languages: as we saw, with default loci the English data are replicated, which suggests that Nouwen's assumption that the grammar does not make available a discourse referent for the complement set applies to ASL just as it does to English. Rather, it is because of iconic conditions on plural loci, not grammar in a narrow sense, that a difference does arise in the case of embedded loci.[15]

23.4.3 High and low loci

In the preceding section, relations of inclusion and relative complementation among loci were shown to be preserved by the interpretation function. We now turn to cases in which the vertical position of loci is meaningful and argues for an iconic analysis as well.

While loci are usually established in a single horizontal plane, in some contexts they may be signed high or low. Our point of departure lies in the inferences that are obtained with high and low loci in such cases. An ASL example without quantifiers, from Schlenker et al. (2013), is given in (30). In brief, high loci are used to refer to tall, important, or powerful individuals, whereas low loci are used to refer to short individuals

(similar data were described for LSF in Schlenker et al. (2013)). Loci of normal height are often unmarked and thus do not trigger any relevant inference.

(30) YESTERDAY IX-1 SEE R [= body-anchored proper name].
IX-1 NOT UNDERSTAND IX-a$^{\text{high / normal / low}}$
'Yesterday I saw R [= body-anchored proper name]. I didn't understand him.'
(ASL; 11, 24; 25)
   a. 7 High locus.   Inference: R is tall, or powerful/important
   b. 7 Normal locus.   Inference: nothing special
   c. 7 Low locus.   Inference: R is short
                                          (ASL, Schlenker et al. 2013: 103)

As can be seen, the relevant inferences are preserved under negation, which provides initial motivation for treating them as presuppositional in nature, a proposal that has been made about the semantic specifications of pronouns, such as gender, in spoken language (Cooper 1983).

Importantly, high and low loci can appear under binding, with results that are expected from the standpoint of a presuppositional analysis. From this perspective, (31a) is acceptable because the bound variable *her$_i$* ranges over female individuals; and (31b) is acceptable to the extent that one assumes that the relevant set of directors only comprises females.

(31) a. [None of these women]$_i$ thinks that I like her$_i$.
      b. [None of these directors]$_i$ thinks that I like her$_i$.

Similar conditions on bound high and low loci apply in (32) (here too, similar examples were described for LSF):

(32) NO TALL MAN THINK IX-1 LIKE IX-a
'No tall man thinks that I like him.' (ASL; 11, 27)
   a. 7 High locus
   b. 6 Normal locus
   c. 3 Low locus   (ASL, Schlenker et al. 2013: 104)

As argued in Schlenker et al. (2013) and Schlenker (2014), it will not do to treat height specifications of loci as contributing information about an *intrinsic* property of their denotations, for instance in terms of being tall or short. This is because in some of their uses they provide information about the spatial position of the upper part of a person's body. This was shown by paradigms in which individuals appeared in several positions in standing or hanging position, upside down. In the latter case, pointing associated with a tall individual became low, in accordance with the general claims of Liddell (2003): the locus behaved like a structured representation of its denotation, with a head and a foot – hence when the individual was introduced as hanging upside down, the locus appeared in upside down position as well, and pointing towards the head of the locus implied pointing *downwards*.

A formal analysis was developed for simple cases in Schlenker et al. (2013), based on the idea that height differences among loci should be proportional to the height differences

among their denotations. The analysis took as its starting point the presuppositional theory of gender features developed in Cooper (1983), given in (33): a pronoun *she*$_i$ evaluated under an assignment function s refers to s(i), *unless* the presupposition triggered by the feminine features of *she* – that its denotation is female – is not satisfied.

(33)   *Gender specifications*
       Let c be a context of speech, s an assignment function and w a world
       (with c_w = the world of c).
       $[[she_i]]^{c, s, w}$ = # iff s(i) = # or **s(i) is not female** in c_w. If $[[she_i]]^{c, s, w} \neq$ #, $[[she_i]]^{c, s, w}$ = s(i).
       (ASL, Schlenker et al. 2013: 106)

Schlenker et al. (2013) extend this presuppositional analysis to high and low loci, but with an iconic condition in the presuppositional part, boldfaced in (34).

(34)   *Height specifications*
       Let c be a context of speech, s an assignment function and w a world
       (with c_w = the world of c).
       If *i* is a locus, *n* is a locus with neutral height, h is a measure of the heights
       of loci in signing space, $\underline{h_c}$ is a measure (given by the context c) of heights of
       objects in c_w, and $\alpha_c > 0$ is a parameter given by the context c,
       $[[\text{IX-i}]]^{c, s, w}$ = # iff s(i) = # or $[(h_c(i) \neq h_c(n)$ **and $h_c(s(i)) – h_c(s(n)) \neq \alpha_c(h(i) – h(n))]$.**
       If $[[\text{IX-i}]]^{c, s, w} \neq$ #, $[[\text{IX-i}]]^{c, s, w}$ = s(i).

       (ASL, Schlenker et al. 2013: 113)

As was the case in our analysis of plural loci in Section 23.4.2, loci have the semantics of variables, but their realization – specifically: their height in signing space – affects their meaning. In words, the condition in (34) considers a pronoun IX-i indexing a locus *i*, and compares its height to that of a neutral locus *n*. It says that the height difference between the denotations s(i) and s(n) should be proportional to the height difference between the loci *i* and *n*, with a multiplicative parameter $\alpha_c > 0$; in particular, this condition imposes that orderings be preserved.[16]

While one might be tempted to posit a small number of heights along the vertical plane, Schlenker (2014) argues that a full-fledged semantics is needed: in paradigms involving astronauts training in a variety of positions and thus rotated in four positions, the loci seemed to track the position of the astronauts in a non-discrete fashion.

Finally, one could ask how integrated into the grammatical system height specifications are. We mentioned above that their semantics in Schlenker et al. (2013) was modeled after that of gender features, albeit with an iconic twist. Schlenker (2014) cautiously suggests that height specifications resemble gender features in another respect: they can somehow be disregarded under ellipsis. An example is given in (35a), where the elided VP has a bound reading, unlike its overt counterpart in (35b). On the (standard) assumption that VP ellipsis is effected by copying part the antecedent VP, this suggests that the feminine features of that antecedent can be ignored by ellipsis resolution, as represented with a barred pronoun in (35b).

(35) In my study group,

    a. Mary did her homework, and John did too.
        => available bound variable reading in the second clause

    b. Mary λi t_i did her_i homework, and John λi t_i did [**do ~~her~~$_i$ homework**] too

    c. Mary did her homework, and John did her homework too.
        => no bound variable reading in the second clause

<div align="right">(ASL, Schlenker 2014: 309)</div>

Schlenker (2014) discusses analogous ASL and LSF examples in which height specifications can be ignored in a similar fashion, but the interpretation of these results requires some care. The main question is whether the ability of an element to be disregarded under ellipsis is *only* true of featural elements or targets a broader class. Schlenker (2014) did not give a final answer, and we will see below that co-speech gestures in spoken language, which certainly do not count as 'features', can almost certainly be disregarded in this way.

In conclusion, the various pronouns we have just discussed display a grammatical behavior as bound variables while also contributing iconic information about the position of their denotations. In this domain, sign language semantics has a more expressive semantics than spoken language, which is devoid of rich iconic mechanisms of pronominal reference.

23.5 Iconicity II: beyond variables

As mentioned at the outset, iconic conditions are pervasive in sign language, and are definitely not limited to the semantics of variable-like constructions. With no claim to exhaustivity, we discuss below three cases that have been important in the recent literature and are also of foundational interest.

23.5.1 *Classifier constructions*

Some 'classifier constructions' were shown in Emmorey & Herzig (2003) to give rise to gradient iconicity effects in native signers of ASL. Specifically, they designed an experiment in which the position of a dot in relation to a bar could be indicated in a gradient fashion by way of a small object classifier (✎-handshape) positioned relative to a flat object construction (�👆-handshape); and they showed that subjects could indeed recover gradient information from the relative position of the signs.

While the formal analysis of such constructions is still under study, it is clear that one will need rules that make reference to iconic conditions. This can be achieved by directly incorporating iconic conditions in semantic rules, as we did for high and low loci above, and as was sketched for the case of classifiers in Schlenker (2011a). Alternatively, one could take these expressions to have a demonstrative component that makes reference to the gesture performed while realizing the sign itself, a proposal made in Zucchi (2011) and in Davidson (2015). An example from Zucchi (2011) is given in (36a) and paraphrased in (36b).

(36) a. CAR CL-vehicle-DRIVE-BY

    b. 'A car drove by *like this*', where the demonstration is produced by the movement of the classifier predicate in signing space (after Zucchi 2011)

Here, CL-vehicle-DRIVE-BY is a classifier predicate used to describe the movement of vehicles. The movement of the classifier predicate in signing space tracks in a gradient fashion the movement performed by the relevant car in real space. As informally shown in (36b), Zucchi takes the classifier predicate to have a normal meaning (specifying that a vehicle moved) as well as a demonstrative component, which is self-referential; in effect, the classifier predicate ends up meaning something like: 'moved as demonstrated by this very sign'. We come back in Section 23.6 to the possibility that sign language semantics should quite generally make reference to a gestural component.

23.5.2 Event visibility or event iconicity?

In our discussion of loci, we saw that these lead a dual life: on the one hand, they have – in some cases at least – the behavior of logical variables; on the other hand, they can also function as simplified pictures of what they denote. As it turns out, a similar conclusion might hold of Wilbur's cases of 'Event Visibility' discussed in Section 23.3.2: sign language phonology makes it possible to make visible key parts of the representation of events, but also to arrange them in iconic ways (see Kuhn (2015) and Kuhn & Aristodemo (2015) for a detailed discussion involving pluractional verbs, i.e., verbs that make reference to plurality of events). A case in point can be seen in (37), which includes three different realizations of the sign for UNDERSTAND, three stages of which appear in (38) (all the signs involve lowered eyebrows, represented as a '~' above the sign).

(37) YESTERDAY MATHEMATICS PROOF IX-1 UNDERSTAND
      'Yesterday I understood a mathematical proof.' (LSF; 49, 27; 4 trials)
      Realization of UNDERSTAND:
      a. 7   normal

      b. 7 $\overset{\sim}{\text{slow}}$ $\overset{\sim}{\text{fast}}$
                => difficult beginning, but in the end, I understood

      c. 5.5 $\overset{\sim}{\text{fast}}$ $\overset{\sim}{\text{slow}}$
                => easy beginning, then more difficult, but I understood
                                                    (LSF, Schlenker 2018: 188)

(38) Initial, intermedial, and final stage in the realization of UNDERSTAND in (37b) (Schlenker 2018: 189)

As illustrated in (38), UNDERSTAND is realized by the progressive closing of a tripod formed by the thumb, index, and middle finger of the dominant hand (right hand for a right-handed signer). But different meanings are obtained depending on how the closure is effected. With a single change of speed, as in (37bc), the result is acceptable and semantically interpretable: if the sign starts slow and ends fast, one infers that the corresponding process had a similar time course; and conversely when the sign starts fast and ends slow (with two changes of speed, the results are deviant).[17] Schlenker (2018) shows that similar iconic modulations can be obtained with the LSF atelic verb REFLECT.

In the long term, two theoretical possibilities should be considered. One is that event iconicity should work alongside Wilbur's Event Visibility Hypothesis, which should thus retain a special status, with discrete but covert distinctions of spoken language made visible in sign language. An alternative is that Wilbur's data are a special case of event iconicity; on this view, telic and atelic verbs alike have the ability to map in a gradient fashion the development of an event, and it is for this more general reason that telic verbs mark endstates in a designated fashion (we come back to this point in Section 23.6).

23.5.3 *Iconic effects in role shift*

We now turn once again to the issue of role shift. In Section 23.3.1, we suggested that role shift can be analyzed as a visible instance of context shift. But we will now see that this analysis is incomplete and must be supplemented with a principle that makes reference to iconicity. In brief, we suggest that role shift is a visible instance of context shift, but one which comes with a requirement that the expressions under role shift should be interpreted maximally iconically. The argument is in two steps. First, we suggest that role shift under attitude reports (= Attitude Role Shift) has a strong quotational component, at least in ASL and LSF. Second, we suggest that role shift in action reports (= Action Role Shift) has an iconic component.

As was mentioned in Section 23.3.1.3, Schlenker (2017b, 2017c) notes that even in his ASL data, which allow for *wh*-extraction out of role-shifted clauses under attitude verbs, some tests suggest that these have a quotational component. First, an ASL version of the test discussed in (22), with ANY (which in some environments has a clear NPI behavior) suggests that it cannot appear under role shift without being quoted. Second, another test of indirect discourse based on licensing of ellipsis from outside the attitude report similarly fails. For simplicity, we will just lay out its logic on an English example:

(39) *Context:* The speaker has recently had a political conversation with John. The addressee and John have never met each other.
  a. You love Obama. John told me that he doesn't.
  b. (#) You love Obama. John told me: 'I don't.'   (ASL, Schlenker 2017c)

In (39a), the elided VP in the second sentence is licensed by the first sentence, and one definitely does not infer that John's words involved an elided VP. The facts are different in (39b), which clearly attributes to John the use of the very words *I don't* – hence a possible deviance if the context does not explain why John might have used a construction with ellipsis. While standard indirect discourse in ASL patterns like English with respect

to the licensing of ellipsis, the facts are different under role shift; there an elided VP is interpreted exactly as if it were quoted.

Finally, some non-linguistic properties of role-shifted clauses must usually be attributed to the agent rather than to the signer, and in this respect role shift differs from standard indirect discourse and resembles quotation. Schlenker (2017c) established this generalization (which is unsurprising for the traditional sign language literature) by asking his consultants to sign sentences in which the signer displays a happy face, indicated by the smiley icon ':-)' in (40b), with the underline showing which signs were accompanied by this facial expression. Importantly, this happy face is not a grammaticalized non-manual expression. The consultant was asked to start the happy face at the beginning of the report, to maximize the chance that it would be seen to reflect the signer's (rather than the agent's) happiness. In standard indirect discourse, this is indeed what was found. In Attitude Role Shift, by contrast, the judgments in (40) suggest that it is more difficult to attribute the happy face to the signer only, despite the fact that it starts outside the role-shifted clause, and that the context is heavily biased to suggest that the agent of the reported attitude was anything but happy.

(40) SEE THAT ARROGANT FRENCH SWIMMER IX-a? YESTERDAY IX-a ANGRY.
      'See that arrogant French swimmer? Yesterday he was angry.'

$$\overline{\text{RS-a}}$$

a. 6.2   IX-a SAY   IX-1 WILL LEAVE.
         'He said: "I will leave.".'

$$\overline{\text{:-)}}$$
$$\overline{\text{RS-a}}$$

b. 4.6   IX-a SAY   IX-1 WILL LEAVE.
         'He said: "I will leave.".' (ASL; 14, 233)
         Rating under the meaning: The speaker is displaying his happiness that the French swimmer said he was leaving.   (ASL, Schlenker 2017c)

At this point, one may conclude that despite the possibilities of *wh*-extraction out of role shift discussed in connection to (20), role-shifted clauses under attitude verbs just involve quotation (possibly mixed quotation, hence the possibility of *wh*-extraction; see Maier (2014a, 2014b)). But as mentioned above, Schlenker (2017b, 2017c) argues (i) that role shift can also be applied, with specific grammatical constraints, to reports of actions rather than of attitudes ('Action Role Shift' vs. 'Attitude Role Shift'); (ii) that in such cases, a quotational analysis would be inadequate, as the situations reported need not have involved thought or speech; and (iii) that nonetheless, role shift applied to action reports comes with a requirement that whatever can be interpreted iconically should be so interpreted. The suggestion is thus that Action Role Shift provides an argument against a quotational analysis and provides independent evidence for positing a rule of context shift, combined with a mechanism of 'iconicity maximization' under role shift.

To get a sense for the main facts, consider (41): in this action report under role shift, the signer's happy face is naturally taken to reflect the agent's attitude. By contrast, in a control sentence without role shift, it can be taken to reflect the speaker's attitude. Thus, under Action Role Shift, a happy face on the agent's part is normally attributed to the agent (see Schlenker (2017c) for refinements, and for LSF data).

(41) SEE THAT ARROGANT FRENCH SWIMMER IX-a? YESTERDAY IX-a ANGRY.
'See that arrogant French swimmer? Yesterday he was angry.'

<u>   RS-a</u>

a. 7   IX-a   1-WALK-WITH-ENERGY(CL-ONE).
'He left with energy.'

<u>   :-)</u>
<u>   RS-a</u>

b. 3.6 IX-a   1-WALK-WITH-ENERGY(CL-ONE).
'He left with energy.'   (ASL; 14, 233)

Rating under the meaning: The speaker is displaying his happiness that the French swimmer was leaving.   (ASL, Schlenker 2017c)

Schlenker (2017c) took these and related to suggest that iconic material is preferably understood to reflect properties of the reported action under role shift.

The analysis proposed in Schlenker (2017c) posits that Attitude and Action Role Shift alike should be analyzed as context shift, but with an important addition: expressions that appear under role shift should be interpreted maximally iconically, i.e., so as to maximize the possibilities of projection between the signs used and the situations they make reference to. Following a long tradition (e.g., Clark & Gerrig 1990), Schlenker (2017c) argues that quotation can be seen as a special and particular stringent case of iconicity, and that the condition of Maximal Iconicity can thus capture properties of both Attitude and Action Role Shift.[18]

If this analysis is on the right track, one key question is why context shift in sign language should come with a condition of iconicity maximization. One possibility is that such a condition exists in spoken language context as well but has not been described yet (however, Anand (2006) argues that in Zazaki context shift need not be quotational). Another possibility is that iconicity maximization under context shift is a specific property of sign language. Be that as it may, it seems clear that if role shift is to be analyzed as context shift, special provisions must be made for iconic effects.

23.6 Theoretical directions

If the foregoing is on the right track, it should be clear that sign languages have, along some dimensions, strictly richer expressive resources than spoken language does, in particular due to their ability to incorporate iconic conditions at the very core of the logical engine of language. There are two conclusions one might draw from this observation.

(i) One could conclude that spoken languages are, along some dimensions at least, a kind of 'simplified' version of what sign languages can offer. Specifically, as a first approximation one could view spoken language semantics as a semantics for sign languages from which most iconic elements have been removed, and indices have been made covert. From this perspective, if one wishes to understand the full scope of Universal Semantics, one might be better inspired to start from sign than from spoken language: the latter could be understood from the former once the iconic component is disregarded, but the opposite path might prove difficult.

(ii) An alternative possibility is that our comparison between sign and spoken language was flawed in the first place; in Goldin-Meadow and Brentari's words (2015: 14), 'sign should not be compared with speech – it should be compared with speech-plus-gesture'. What might be special about sign languages is that signs and co-speech gestures are realized in the same modality. By contrast, they are realized in different modalities in spoken language, which has led many researchers to concentrate solely on the spoken component. This leaves open the possibility that when co-speech gestures are reintegrated to the study of spoken language, sign and spoken languages end up displaying roughly the same expressive possibilities.

Let us give a few illustrations of how the debate could be developed.

23.6.1 Plural pronouns

We noted in Section 23.4.2 that plural pronouns in ASL and LSF can give rise to instances of 'structural iconicity' when a plural locus is embedded within another plural locus. One could view this as a case in which sign language has a mechanism which is entirely missing in spoken language. But the realization of sign language loci makes it possible to use them simultaneously as diagrams. From this perspective, the right point of comparison for our examples with 'complement set anaphora' in Section 23.4.2 are spoken language examples accompanied with explicit diagrams with the same shape as embedded loci in (28), and to which one can point as one utters the relevant pronouns. For this reason, a comparison between spoken and sign language should start with situations in which speakers can use gestures to define diagrams. This comparison has not been effected yet.

23.6.2 High loci

As summarized in Section 23.4.3, it was argued in Schlenker et al. (2013) and Schlenker (2014) that high loci have an iconic semantics, and in addition that their height specifications behave like 'features' in some environments, notably under ellipsis: just like gender features, height specifications can apparently be disregarded by whatever mechanism interprets ellipsis resolution. We fell short of arguing that this shows that height specifications *are* features, for good reason. First, Schlenker (2014) shows that it is hard to find cases in which height specifications really behave differently from other elements that contribute presuppositions on the value of a referring expression (some paradigms displaying this difference were found in ASL but not in LSF). Second, when co-speech gestures are taken into account in spoken languages, it appears that they too can be disregarded under ellipsis (Schlenker 2018).[19] Thus in (42a), the co-speech gesture (for a tall person) that accompanies the verb phrase can be disregarded under ellipsis; whereas in the control in (42b), deviance is obtained if the gesture that accompanies the antecedent verb phrase is explicitly repeated in the second clause (whereas a gesture for a short person is acceptable).

(42) I had two guys standing in front of me, one of them very short and the other one very tall.

a. The tall one allowed me to remove **[his glasses]**, but the short one didn't.

b. The tall one allowed me to remove **[his glasses]**, but the short one didn't allow me to remove # **[his glasses]** / ok **[his glasses]**.

(Schlenker 2018: 198)

These observations suggest that one could account for height specifications of loci in at least two ways. One could analyze them by analogy with features in spoken language, and argue that they share their behavior under ellipsis. Alternatively, one could seek to analyze height specifications as co-speech gestures that happen to be merged with signs, and to explain their behavior under ellipsis by the fact that other co-speech gestures can somehow be transparent to ellipsis resolution.

23.6.3 Role shift[20]

We suggested above that role shift is 'visible context shift', with an important addition: Attitude and Action Role Shift alike have an iconic component ('Maximize Iconicity!') which has not been described for spoken language context shift. But one could challenge this analysis by taking role shift to be in effect indicative of the fact that the role-shifted signs have a demonstrative, gestural component, and thus are in effect both signs and co-speech gestures. This is the theoretical direction explored by Davidson (2015). Following Lillo-Martin (1995, 2012), Davidson takes role shift to behave in some respects like the expression 'be like' in English, which has both quotational and co-speech uses, as illustrated in (43).

(43) a. John was like 'I'm happy'.
b. Bob was eating like [gobbling gesture].　　　　(Davidson 2015: 487, 489)

More specifically, Davidson suggests that in role shift the signer's body acts as a classifier and is thus used to demonstrate another person's signs, gestures, or actions. She draws inspiration from Zucchi's analysis of classifier constructions, briefly discussed in Section 23.5.1 above. Thus, for Davidson, no context shift is involved; rather, the signer's body is used to represent another individual in the same way as the classifiers discussed in Section 23.5.1 represent an object. A potential advantage of her analysis is that it immediately explains the iconic effects found in role shift, since by definition role shift is used to signal the presence of a demonstration. We refer the reader to Schlenker (2017c) for a comparison between the context-shifting and gestural analyses.

23.6.4 Telicity

Strickland et al. (2015) revisit Wilbur's Event Visibility Hypothesis, discussed in Sections 23.3.2 and 23.5.2 above. They show that non-signers that have not been exposed to sign

language still 'know' Wilbur's generalization about the overt marking of telic endpoints in sign language: when asked to choose among a telic or atelic meaning (e.g., 'decide' vs. 'think') for a sign language verb they have never seen, they are overwhelmingly accurate in choosing the telic meaning in case endpoints are marked. Furthermore, this result holds even when neither meaning offered to them is the actual meaning of the sign, which rules out the possibility that subjects use other iconic properties to zero in on the correct meaning. These results can be interpreted in at least two ways. One is that Wilbur's principle is such a strong principle of Universal Grammar that it is accessed even by non-signers. An alternative possibility is that these use general and abstract iconic principles to determine when a sign/gesture can or cannot represent a telic event. This leaves open the possibility that Event Visibility derives from a general property of cognition rather than from specific properties of sign language – and possibly that similar effects could be found with co-speech gestures in spoken language (see Schlenker (2017a) for potential differences between iconic enrichments in signs vs. gestures).

Acknowledgments

Notes

1 We use the term 'logical' loosely, to refer to primitive distinctions that play a key role in a semantic analysis. Some of our examples are logical categories in the strict sense (e.g., logical variables), but others are not (e.g., the representation of aspectual classes). We avoid the term 'LF visibility' because it might be associated with a different idea, namely that a particular level of representation posited in some generative approaches, called 'LF', might be more transparently visible in some languages than in others. It has sometimes been claimed, for instance, that the 'LF position of quantifiers' is relatively transparently represented in Hungarian (e.g., Brody & Szabolcsi 2003); this syntactic claim is of course distinct from the hypothesis discussed here.

2 We state the hypothesis existentially, as being about *some* mechanisms that are covert in spoken language but overt in sign language. This is in fact a well-worn type of argument in semantic typology. For instance, Szabolcsi 2000 (following Kiss 1991) argues that Hungarian 'wears its LF on its sleeve' because the scope of quantifiers is disambiguated by their surface position.

3 This section borrows from Schlenker et al. (2013) and Schlenker (2014).

4 While pointing can have a variety of uses in sign language (Sandler & Lillo-Martin 2006; Schlenker 2011a), we will restrict attention to pronominal uses.

5 For simplicity, we gloss IX-a as *he*, but without context, this pronoun could just as well refer to a female. On a theoretical level, we note that in order to provide a formal treatment of (10), we might need to posit a rule of 'locus erasure' – a point we will return to in Section 23.2.4.

6 This section borrows from Schlenker (2013a,b).

7 The eyebrow raise accompanies only the pronoun. Eyebrow raising is regularly found in topic and focus positions in general, and on *if*-clauses in particular; we include it because this non-manual marker appeared in the original transcriptions cited here.

8 This section borrows from Schlenker (2016).

9 This section borrows from Schlenker (2017b).

10 At this point, we assume that quotation must target an entire clause, and we come back below to the possibility of a theory with 'partial quotation', as argued in Maier (2014b).

11 In the end, Quer (2013) suggests on the basis of syntactic evidence that Attitude Role Shift in LSC can in some contexts involve quotation, but that in other contexts it involves *bona fide* indirect discourse with some shifted indexicals. For present purposes, we are only concerned with cases that can be shown not to involve standard quotation.

12 Informant 2 gave HERE = LA with a rating of 5/7; HERE = NYC with a rating of 2.5/7.

13 This section borrows from Schlenker (2013b) and Schlenker et al. (2013).

14 If we wanted to state an analogous condition in a more standard system in which the variables are letters rather than loci, we could for instance require that the denotation s(v) of a variable called *v* should be a subpart of the denotation s(w) of a variable called *w* because graphically *v* can be viewed as a subpart of *w*. Because inclusion of one symbol in another is so uncommon with letters, this would of course be a very odd condition to have; but it is a much more natural condition when the variables are loci rather than letters.

15 One additional remark should be made in connection with our discussion of the debate between the analyses of loci as variables vs. as features (in Section 23.2.4). It is notable that the locus *b* in (27a) is not inherited by way of agreement, since it is not introduced by anything. From the present perspective, the existence of this locus is inferred by a closure condition on the set of loci, and its interpretation is inferred by an iconic rule. But the latter makes crucial reference to the fact that loci have denotations. It is not trivial to see how this result could be replicated in a variable-free analysis in which loci do not have a denotation to begin with. Presumably, the complement set locus would have to be treated as being deictic (which is the one case in which the variable-free analysis has an analogue of variable denotations). This might force a view in which complement set loci are handled in a diagrammatic-like fashion, with co-speech gestures incorporated in signs – a point to which we return in Section 23.6.

16 Since bodies are not points, further hypotheses were needed to determine which parts of locus denotations mattered in the relevant ordering; an initial hypothesis is that when it comes to people, their upper bodies matter:

(i) Partial hypothesis (slightly modified from Schlenker et al. 2013):
When evaluating the height of loci denotations,
   a. the position of c_a is assessed by considering the real or imagined position of the upper part of the body of c_a in c_w;
   b. if s(i) is a person, the position of s(i) corresponds to the position of the upper part of the body of s(i) in c_w.

17 In this example, the facial expressions remain constant, with lowered eyebrows throughout the realization of the sign, encoded as '~' on the relevant parts of the sign; more natural examples are obtained when the facial expressions are also modulated, and in such cases, more changes of speed can be produced and interpreted – but in these more complex examples it is difficult to tease apart the relative role of the manual vs. non-manual modulation in the semantic effects obtained.

18 More specifically, putting together the non-iconic (context-shifting) part of the analysis developed in Section 23.3.1 and these iconic conditions, the theory has the following structure:

(i) Role shift has a broadly uniform semantics across attitude and action cases: it shifts the context of evaluation of the role-shifted clause.

(ii) In ASL and LSF, role-shifted indexicals are obligatorily shifted. Things are different in LSC and DGS, where mixing of perspectives is possible.

(iii) In ASL and LSF, all indexicals can appear under Attitude Role Shift, but only some indexicals can appear under Action Role Shift (this was captured formally by assuming that Action Role Shift gives rise to different kinds of shifted contexts than Attitude Role Shift).

(iv) Under Attitude and Action Role Shift alike, signs are interpreted maximally iconically in the scope of the context shift operator.
- In attitude reports, every sign can be interpreted as being similar to an element of the situation which is reported – namely by way of quotation.
- In action reports, this is not so (as these need not involve speech or thought acts), but all potentially iconic features of signs are interpreted iconically and thus taken to represent features of the reported situations.

In both cases, expressions that appear under role shift are both used (as these are instances of indirect discourse) and mentioned because they have a strong iconic (and sometimes quotational) component.

19 More sophisticated work on this issue is being conducted by John Gajewski at University of Connecticut.

20 This paragraph borrows from Schlenker (2017c).

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