Corder

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Corder

PITY	(object)
PUSH	(subject and object)
RESPECT	(object)
SCOLD	(subject and object)
SEE	(object)
SHOW	(object)
STARE	(subject and object)
TEASE	(subject and object)
TELL	(object)
WARN	(subject and object)

Examples of Spatial Verbs in ASL:

BORROW

GIVE

LEND

PUT

prepositional phrases (is on, is next to, is under, etc.)

Appendix B: ASL Verbs by Category

Examples of non-directional predicates in ASL:
BATHE
BUY
CATCH
COMMUNICATE
COOK
EAT
ENJOY
HAVE
HOPE
LIKE
LIVE
LOVE
MARRY
NEED
PAY
PREFER
READ
REMEMBER
SAY
SELL
SERVE
TALK
THINK
THROW-AWAY
VISIT

Examples of directional predicates in ASL:

ASK	(subject and object)
BITE	(subject and object)
BLAME	(subject and object)
HATE	(subject and object)
HELP	(subject and object)
IGNORE	(object)
INFLUENCE	(subject and object)
INFORM	(subject and object)
INSULT	(subject and object)
INVITE	(subject and object)
KISS	(subject and object)
LOOK-AT	(object)
NOTICE	(object)
COPY	(subject and object)
PERSUADE	(subject and object)
PICK-UP	(object)

Appendix A: Handshapes Used in ASL Signs

The handshapes used to articulate signs in ASL are typically named after the letters or numbers that the signs represent (Wilbur 1987). The following basic handshapes are recognized for the transcriptions in this paper:

A, a   B, b   C, c   E, e   F, f   G, g   H, h   I, i

K, k   L, l   O, o   R, r   V, v   W, w   Y, y   Three, 3

Five, 5
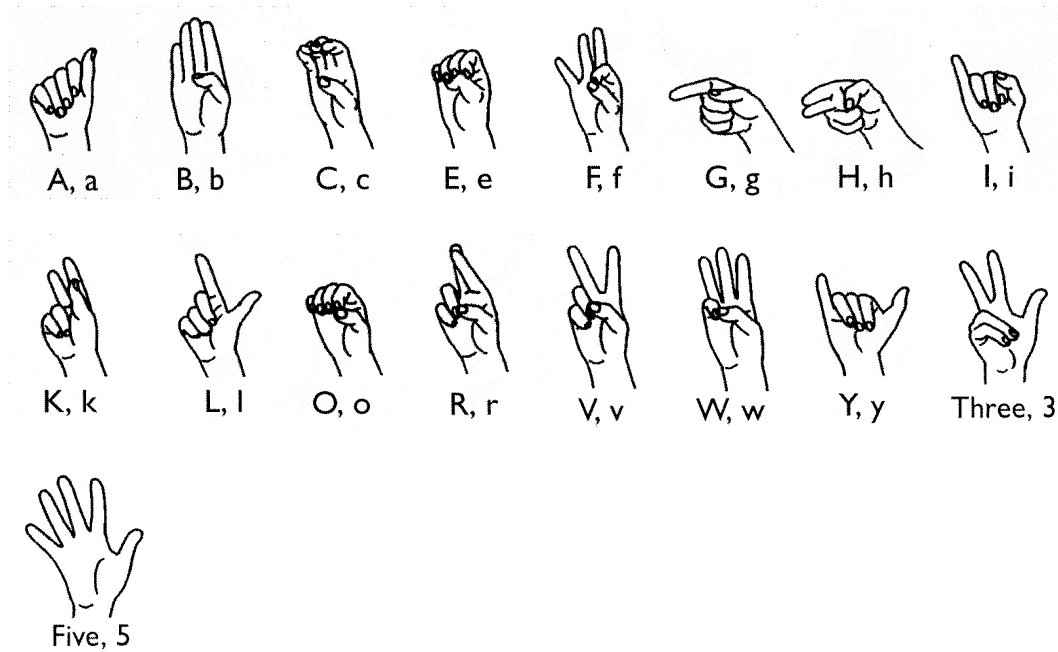
In addition, modifications to the basic handshapes can be included in the description of a handshape for a sign. For example, the above handshapes can be "bent" (fingers that are extended in the original sign are bent slightly), "open" (the thumb is extended away from the hand), or "flattened" (the second knuckle if normally bent fingers is kept straight). Sample handshapes of this type are given below.

Flattened C Flattened O Modified X
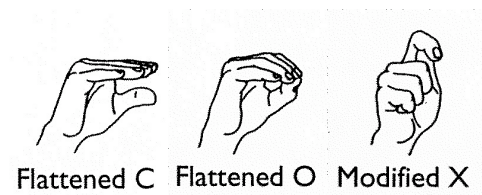
found, the directionality of certain predicates was found to be predictable based on valency. In particular, ditransitive predicates were found to be directional, while intransitive predicates were found to be non-directional; transitive verbs were found to fall into both categories. It remains an open question whether any means can be found to predict whether a given transitive predicate will be directional or non-directional. One possibility is that a finer-grained categorization is needed to make the patterns among this group clearer. Cormier (year) discusses one such categorization of predicates that might prove insightful. Another area for further study is the connection between directionality and syntactic agreement. Although there is reasonable justification for associating the two, Section 5 of this paper found that there are some odd implications for such theories if directionality is, indeed, predictable based on semantic qualities.

Other questions are raised by the very idea of a syntactic marker that is only optionally expressed. Primarily, no explanation is given of why the generation of non-manual agreement markers should occur entirely optionally. It is not clear what occupies the agreement nodes when neither form of agreement is articulated, nor how a single agreement node could include information for both manual and non-manual marking of agreement.

5.3 Summary

This section looked at two different theories that, in trying to explain the appearance of null arguments in ASL, came to the conclusion that directional and non-directional predicates behave differently syntactically. Lillo-Martin (1991) argued that only directional predicates agreed with their arguments syntactically, while Bahan (2000) argued that all predicates agreed with their arguments syntactically, but that the phonetic forms of the agreement markers differed between directional and non-directional predicates.

In either case, directionality was equated with a difference in syntactic behavior. This was compared to the results of section 4, which suggested that directionality was predicable based on valency, at least for ditransitive and intransitive predicates. If directionality is related to syntactic behavior, then this means that syntactic behavior is in some way linked to semantic properties of predicates, which is an odd conclusion that warrants further study.

6.0 Conclusion

This thesis explored the distinction between directional and non-directional predicates in ASL. While no phonetic distinctions between the two categories were

Bahan argues that this sort of example shows that null arguments are always licensed by syntactic agreement in ASL; it is just that the phonetic form of the agreement marker can be manual or non-manual.

With respect to the predictability of directionality, Bahan's theory seems much easier to accept. The underlying syntactic representation of a sentence does not change based on the semantic nature of its predicate, which avoids some of the predictions about the nature of language in general that might arise from Lillo-Martin's analysis. Still, the prediction that the phonetic form(s) that syntactic agreement markers can take is somehow tied to the semantic properties of a predicate is a strange one. In addition, several other things are troubling about Bahan's work.

As evidence that nonmanual markings of subject and object agreement occupy different nodes on the syntactic tree, Bahan shows through video examples that the non-manual marking of subject agreement begins before the non-manual marking of object agreement. From this, he concludes that the subject agreement marked must occupy a node higher in the tree than the object agreement marker. However, this conclusion rests largely on the assumption that everything in the syntactic tree must be expressed chronologically from top to bottom, which seems to be a huge assumption in a language like ASL whose mode of articulation would not necessarily force one element to be expressed before another; it is not uncommon for the articulation of one sign to overlap with the articulation of another sign. In addition, the video is of Bahan himself; the difference between the start of the head tilt and the eye gaze in his examples is a few video frames (fractions of a second), and is not compared to the signing of other native signers.

agreeing with. Eye gaze agreement will be indicated as [e-g$_a$]. In the sentence *John helps Mary*, the subject can be identified with a head-tilt towards John while the object is identified with an eye-gaze towards Mary:

[22] _____[e-g$_b$]
 _____[h-t$_a$]
 J-O-H-N$_a$ $_a$HELP$_b$ M-A-R-Y$_b$
 John helps Mary.

In the above example, both manual and nonmanual means are used to express the subject and object of the verb. The introduction of a nonmanual expression of agreement does not change the behavior of directional verbs with respect to null arguments. But Bahan goes on to say that the same thing can be done with a verb like *LOVE*:

[23] ____[e-g$_b$]
 _____[h-t$_a$]
 J-O-H-N LOVE M-A-R-Y
 John loves Mary.

Once this non-manual identification of the subject and object has been identified as syntactic agreement, Bahan says, the null argument examples from above become grammatical:

[24] a) _____[e-g$_b$]
 _____[h-t$_a$]
 LOVE M-A-R-Y
 He (John) loves Mary.
 b) [e-g$_b$]
  [h-t$_a$]
 J-O-H-N LOVE
 John loves her (Mary).
 c) [e-g$_b$]
  [h-t$_a$]
 LOVE
 He (John) loves her (Mary).

Looking at Lillo-Martin's analysis in light of the findings in Section 4 raises some interesting questions. If directionality can be at least partially predicted based on valency, and directionality is linked to the presence or absence of syntactic agreement, then it follows that ditransitive predicates always show syntactic agreement, intransitives never show syntactic agreement, and transitives may or may not show syntactic agreement. This is an unsettling conclusion; the implication is that the syntactic structure of a language may vary based on semantic factors.

5.2 Bahan Analysis

Bahan (2000) addresses the most troubling aspect of Lillo-Martin's findings as they relate to the apparent predictability of directionality. He says that no other language is known to license null arguments through syntactic agreement for only certain predicates. Rather than claiming that directionality is linked to whether or not a given predicate can agree syntactically with its arguments, he argues that it is linked to the phonetic form that the agreement can take: syntactic agreement is possible for all predicates, but manual expression of agreement is only possible for directional predicates. Another form of agreement marking, nonmanual agreement, can be optionally expressed with both directional and non-directional predicates.

In non-manual syntactic agreement marking for a transitive verb, the head tilts towards the subject while the eyes look in the direction of the object. Nonmanual agreement that is articulated as a head-tilt will be indicated in all following examples as $[h\text{-}t_a]$, where a is the point in space associated with the argument that the head-tilt is

(1984). Since non-directional verbs don't have any agreement features, Lillo-Martin concludes that they must license their null arguments through coreference with a topic (either base-generated or moved; the two are not distinguished in her work.)

null-arguments while non-directional predicates do not. As evidence, she cites examples

like [20 a-d] and[21 b-d]:

[20] a) J-O-H-N$_a$ $_a$HELP$_b$ M-A-R-Y$_b$
John helps Mary

b) $_a$HELP$_b$ M-A-R-Y$_b$
He (John) helps Mary.

c) J-O-H-N$_a$ $_a$HELP$_b$
John helps her (Mary).

d) $_a$HELP$_b$
He (John) helps her (Mary).

[21] a) J-O-H-N$_a$ LOVE M-A-R-Y$_b$
John loves Mary

b) * LOVE M-A-R-Y$_b$
He (John) loves Mary.

c) * J-O-H-N$_a$ LOVE
John loves her (Mary).

d) * LOVE
He (John) loves her (Mary).

With *HELP* (a directional verb), null subjects and objects are grammatical. With

LOVE (a non-directional verb), no null arguments are grammatical. Lillo-Martin argues

that this is because directionality is analogous to syntactic agreement. She says that

directional verbs show syntactic agreement with their subjects, while non-directional

verbs do not show any syntactic agreement. Consequently, null arguments can be

licensed through agreement with directional predicates, but not with non-directional

predicates. For directional verbs like *HELP*, then, null arguments are grammatical because

the agreement markers on the verb itself are sufficient to identify the arguments. In non-

directional verbs, on the other hand, there is no overt syntactic marking of agreement on

the verb itself. Lillo-Martin concludes that this is because there is no syntactic agreement

between the verb and its arguments.[11]

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[11] Lillo-Martin also notes that in some contexts, sentences like [21b] and [21c] seem to be grammatically acceptable. To account for this fact, she looks to the work of Huang

semantic roles that can be assigned by directional and non-directional strictly transitive predicates.

4.3 Summary

This section has explored the possibility that there is a semantic distinction between directional and non-directional verbs. The number of theta roles assigned by verbs provided a means of identifying the category that some verbs belong to; all intransitive verbs seem to be non-directional while all ditransitive verbs seem to be directional. The specific roles that are assigned by transitive verbs were examined, but no further distinction between directional and non-directional verbs was found. Still, a semantic distinction between verb classifications seems promising and is able to predict the directionality of at least some predicates. In light of this finding, the next section looks at some syntactic theories of ASL that conclude that directionality is tied to syntactic agreement. Two such theories are outlined, and the implications on those theories of the findings from this section are discussed.

5.0 Implications for Syntactic Theory

The previous section showed the directionality of predicates to be predictable for at least some predicates; ditransitive predicates are always directional while intransitives are never directional. This finding is interesting when compared to theories that tie directionality to syntactic agreement properties. This section describes two such theories and the implications that the predictability of directionality might have on them.

5.1 Lillo-Martin Analysis

Lillo-Martin (1991) looks to directionality as a means of explaining the question of null argument licensing in ASL. She observes that directional predicates seem to allow

Setting aside potential problems like *LOVE/HATE*, perhaps there is a specific theta-role that can be assigned only by one of the two types of predicates. If so, this could be used to predict whether a strictly transitive predicate will be directional or non-directional. On the other hand, minimal pairs of predicates that assign the same theta-roles but differ interms of directionality provide evidence that the specific theta-roles assigned by a predicate do not influence its directionality.

Consider first the theta-roles of agent and patient. They are assigned by both *INVITE* and *BATHE*, but *INVITE* is a directional predicate and *BATHE* is a non-directional predicate. These theta-roles do not seem to be useful for predicting the directionality of a predicate.

Perhaps, then, themes are more significant. Many directional verbs, like *LOAN*, represent the motion of an object from one location to another, so they might be expected to have themes. However, non-directional predicates can also have themes; *SERVE* is one such verb.

Many directional verbs have goals and sources; unfortunately, these predicates also tend to have themes and to be ditransitive, so they are not useful to look at in terms of categorizing strictly transitive verbs. There do not seem to be many strictly transitive predicates that assign these theta-roles, and the few that do seem to be intransitive. *THROW-AWAY* is a non-directional verb with a source (but not a specified goal) while *serve* is a non-directional verb with a goal (but not a specified source). There are few, if any, intransitive predicates that assign both a source and a goal.

Finally, the experiencer role can be assigned by both *HOPE*, a non-directional verb, and *SHOW*, a directional verb. No consistent difference appears, then, between the

Valency, then, seems to be a promising means of predicting the directionality of a predicate. Ditransitive predicates always seem to be directional, while intransitive predicates always seem to be non-directional. Only strictly transitive (single-object) verbs remain unpredictable in terms of directionality.

4.2.2 Particular Theta-Roles

Based on this data, a semantic account for the categorization of predicates seems promising. Simply counting the number of theta roles that a predicate can assign assures that all intransitive verbs will be non-directional and that all ditransitive verbs will be directional. Determining which strictly transitive verbs will be directional and which will be non-directional could be merely a matter of looking at which particular theta-roles are assigned by a given predicate.

The most glaring issue to be dealt with here is the distinction between *LOVE*, a non-directional verb, and *HATE*, a directional verb. The semantic roles assigned by each are almost exactly the same, but they fall into different verb categories. Verbs describing emotions are unusual, though, in that they can almost be understood to have an implied movement of a feeling or attitude between the person feeling the emotion and the person or thing causing the emotion. That is, in *John loves Mary*, it is plausible that the love is acting as an intangible theme. In fact, in languages like Irish, emotions like *hate* are expressed as nominals; *John hates Mary* is expressed as *John has hate for Mary*. In these languages, words like *hate* do seem to be acting as themes. Thus, even with the apparent minimal-pair of *LOVE* and *HATE*, it is worth further exploring the possibility that semantic roles can be used to separate other strictly transitive verbs into categories.

directional.[10] It thus seems reasonable to conclude that directional predicates must have at least two semantic arguments. The next possibility to explore, then, is that all predicates with more than a certain number of semantic arguments must be directional.

Many non-directional predicates, like *LIVE*, have only a single semantic argument. Others, like *LOVE*, have two semantic arguments. But there seem to be few, if any, ditransitive non-agreeing verbs. The verb *STUFF* is non-directional, but the proposition *She stuffs the pillow with cotton* seems to require the use of a classifier predicate in place of using the sign for *STUFF*. In English, some transitive verbs can be coerced into having ditransitive readings; if John is reading a book aloud while Mary listens, it is grammatical to say *John reads the book to Mary.* But in ASL, *JOHN READ BOOK MARY* is not grammatical. To express the idea that John is reading the book to Mary, the sign *SPEAK* or *SIGN* must be used along with the sign *READ* to tell how John is reading the book to Mary. For example, if John is reading the book aloud, then [19] could be used to mean that he is reading the book and speaking the words to Mary:

> [19] BOOK J-O-H-N READ SPEAK$_b$ M-A-R-Y$_b$
> *John reads the book aloud to Mary.*

The inability of verbs like *READ* to be given ditransitive readings in ASL suggests that non-directional verbs may simply be unable to carry ditransitive meanings.

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[10] Cormier (1998) claims that there are some intransitive agreeing verbs, including *DIE* and *COLLAPSE*. In both cases, she says that there is a plain form of the verb as well as an inflected form of the verb. In personal communication, Rebecca Weinberger (November 2002) and Donna Jo Napoli (November 2002) were likewise unable to understand how these verbs could be inflected, and attempts to reach Cormier for clarification have been unsuccessful. Cormier herself argues, though, that these verbs are rare enough that her analysis does not account for them. It seems likely that "inflection" she observes is actually an instance of role-playing, which is common with all types of ASL verbs and can look very similar to syntactic agreement. If these verbs truly do show syntactic agreement, they are the only verbs in ASL to show agreement with their subject only (all other verbs agree with their subject and their object or with only their object.)

considered here, locative roles can be easily split into source and goal roles. In some cases it is possible for one argument to fulfill the requirements of more than one semantic role name. For example, in the sentence *John lent Mary the book*, John can be considered the agent (he is the one actively doing the lending) or the source (the book moves from John to Mary).

4.2 Presentation of Data

This section will explore the possible relationship between directionality and several semantic features of predicates. First, directionality is compared to the valency of a predicate.

4.2.1 Valency

As a starting point for an analysis of the relationship between theta roles and directionality, it is worth exploring the possibility that it is simply the number of theta roles that a verb assigns that determines if it can show a direction change based on its arguments. Since any movement path needs both a starting point and an ending point, perhaps directional predicates need to have a certain number of arguments. An even stronger finding would be that in addition, predicates with more than a certain number of arguments have to be directional.

Consider first the possibility that only predicates with a certain number of arguments can be directional. Directional predicates can also have two semantic arguments; both BITE [13] and PERSUADE [15] assign two semantic roles. In addition, directional predicates like LOAN [11] may have more than two semantic roles to assign. LOAN has three obligatory theta roles: the agent/source, the patient/goal, and the theme. However, there are very few, if any, intransitive (single-argument) predicates that are

complexity and its directionality. Since phonetic characteristics do not seem useful in predicting directionality, semantic features might prove more interesting. The next section explores the possibility that there is a semantic distinction between directional and non-directional predicates.

4.0 Semantic Analysis

4.1 Why semantic analysis is reasonable

Any verb that is directional depends on the spatial locations associated with its arguments to determine its movement. Directional verbs like the sign for *LEND* represent the actual movement of an object from the possession of one person to the possession of another. Given that the movement it represents must have a source and a goal, and that these seem to correspond with the starting and ending points of the motion path of the verb, it seems reasonable to look at the semantic (theta) roles assigned by predicates for some hint as to which predicates can and cannot be directional. In particular, it is plausible that certain theta roles must be assigned by a verb in order for it to be directional. Since there is no real consensus as to how many different theta roles should be recognized or what they should be called[9], for now it seems sufficient to look at only the most standardly recognized theta roles. The examples in this paper will only use theta roles that can be identified as themes, agents, patients, experiencers, sources and goals. For all of the data

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[9] There have been several proposals regarding how to define distinct theta roles. Dowty (1987) argues in favor of only recognizing two "proto-roles". He defines the "proto-agent" and "proto-patient" in terms of a number of characteristics of each, and then says that each argument of a verb will carry some combination of the features of a proto-agent and a proto-patient. While this more generalized terminology may be useful in describing the theta roles relevant to ASL verbs in the future, it seems unnecessarily complex for an initial look at the possible links between verb categorizations and semantic properties. Should a semantic account for verb categorization prove promising, however, Dowty's alternative description of semantic roles might prove useful in the future.

[17] TELL

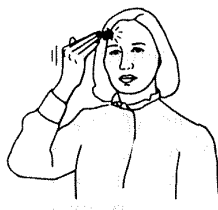| H	M	H
[speaker's chin]		[object]
[palm down]		[palm up]
[1 handshape]		[1 handshape]

The dominant hand begins with the index finger under the speaker's chin, then moves out in the direction of the predicate's object

[18] KNOW

M	H
	[speaker's forehead]
	[palm down]
	[bent B handshape]

The dominant hand moves in to point to the speaker's forehead.

Therefore, all possible hand combinations (1 hand, 2 hands that move symmetrically, and 2 hands where one hand serves as a base) seem to be possible for both directional and non-directional predicates. No predictions can be made based on number of hands with respect to a sign's directionality.

3.4 Summary

This section examined the possibility that directional and non-directional verbs could be distinguished based on some phonetic difference. Handshapes, number of movement directions and the number of hands used in the articulation of signs were examined, but no condition was found to be either necessary or sufficient for a verb to be directional. There does not seem to be much of a connection between a sign's phonetic

3.3.3 Number of Hands Used

Directionality might be limited by phonetic complexity in terms of the number of hands used for a sign. As discussed above, a sign fall into one of three categories: one handed signs, signs in which both hands move symmetrically, and signs in which one hand serves as the base while the other hand moves.

Previous examples have already shown, however, that a directional predicate may use two hands symmetrically (*LOAN*, [11]). A plain predicate like *LOVE* [12] may also use two hands symmetrically. Directional predicates like *BITE* [13] use two hands where one hand serves as the base, while plain predicates like *READ* [16] can also use this hand combination. In addition, one-handed signs can be either directional [17] or non-directional [18]:

[16] READ

	H	M	M	M	H

Dominant Hand:
    [top of base palm]   [bottom of base palm]
    [palm down]   [palm down]
    [V handshape]   [V handshape]
Base Hand
    [neutral space]   [neutral space]
    [palm in]   [palm in]
    [B handshape]   [B handshape]

The base hands stays in a B-handshape with the fingers pointing up and the palm towards the signer while the dominant hand moves up and down along the base hand in a V-handshape.

the starting and ending points of its movement path do not change based on its arguments:

[14] MARRY

	H	M	H
Dominant Hand:			
	[in front of speaker's chest]		[on top of base hand]
	[palm down]		[palm down]
	[C handshape]		[C handshape]
Base Hand:			
	[in front of speaker]		[in front of speaker]
	[palm up]		[palm up]
	[C handshape]		[C handshape]

The base hand is held at a point near the bottom of the neutral signing space. The dominant hand begins at about chest level in the neutral signing space and moves down to the base hand.

Further examination shows that a limit on the number of directions of movement cannot even be a necessary condition for a verb to show directionality; PERSUADE [15] changes directions but agrees with its object:

[15] PERSUADE

|	H	M	M	M	H
	[neutral position]				[object]
	[palms down]				[palms down]
	[X handshape]				[X handshape]

Both hands move from a neutral position in the signing area towards the object of the predicate, then move back away from the object, and then return to the position associated with the object.

Like number of handshapes, the number of movement directions used in articulating a sign does not seem to be tied to the sign's directionality. Signs that move in only a single direction can be non-directional predicates, while directional predicates can move in more than one direction. A final phonetic condition for directionality might be the number of hands used to articulate the sign.

[13] BITE

	H	M	H
Dominant hand:			
	[subject]		[object]
	[palm in]		[palm in]
	[C handshape]		[flat O handshape]
Base hand:			
	[object]		[object]
	[palm down]		[palm down]
	[open B handshape]		[open B handshape]
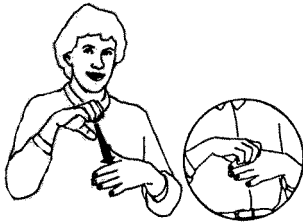
The base hand stays at the location associated with the object in a B handshape while the dominant hand moves from the location of the subject to the location of the object and closes to a flat O handshape around the base hand.

It seems that there are no connections to be made between phonetic complexity in terms of number of handshapes and the ability of a sign to be directional. Perhaps, though, directionality is tied to the number of directions of movement involved in articulating a sign.

3.3.2 Total Number of Movement Directions

Another reasonable hypothesis might be that the limiting factor is not the number of handshapes involved in the sign, but, rather, the number of directions of movement involved in articulating the sign. As transcribed in [11] above, LOAN involves a single movement from the location associated with its subject to the location associated with its object. The possibility that *all* directional verbs must have a single movement involved in their articulation is worth exploring. Examples such as *marry* show that not all predicates with only a single direction of movement are necessarily directional; MARRY [14] involves only a single movement in a single direction, but it is not a directional predicate because

[12] LOVE

> H
> [speaker's chest]
> [palms towards chest]
> [A handshape]

The arms are crossed with both hands in the A handshape and in contact with the speaker's chest.

What is more interesting is to look at whether some limitation on handshapes might be a necessary condition for a sign to be directional; it is conceivable that directionality could be somehow blocked as a result of the phonetic complexity resulting from multiple handshapes. Unfortunately, this, too, fails to provide interesting results, as there are directional predicates that involve multiple handshapes. *BITE* [13] is one such predicate; it involves a total of three different handshapes:

sign, or the total number of movement directions needed to articulate the sign. This section explores each of these in turn as a possible distinguishing factor between directional and non-directional predicates.

3.3.1 Total Number of Handshapes

One possible account for the categorization of predicates is that the total number of handshapes involved in articulating the signs limits directional verbs phonetically. Many directional signs seem to involve two or fewer total handshapes. *HELP* and *HATE* each have two total handshapes; *HELP* has one handshape for its base hand and one hand for its dominant hand, while *HATE* has two different handshapes for its dominant hand. Further, *GIVE* and *LOAN* each have only a single hand-shape:

[11] LOAN

H	M	H
[subject]		[object]
[palms in]		[palms in]
[K handshape]		[K handshape]
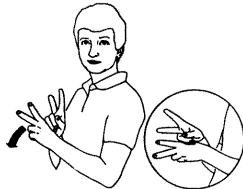
The dominant hand is placed on top of the non-dominant hand with both hands in the K handshape. The hands move from the location of the subject to the location of the indirect object.

Clearly, just having two or fewer handshapes is not a sufficient condition for a sign be directional; many non-directional predicates use only one or two handshapes. For example, *LOVE* [12] only uses a single handshape but does not change its location based on its subject or object:

reason it doesn't show directionality is simply because its phonetic form is already too complex to carry any new meaning; it is difficult to imagine from a practical standpoint how the sign's articulation could change direction or orientation in a way suitable for the range of agreement possibilities that directional verbs exhibit.

3.2 Explanation of Notation

To discuss individual lexical entries and their phonetic properties, a means is needed to capture all of the phonetic information about a single sign in its transcription. Clearly, the word-by-word gloss used in previous sections does not accomplish this. Instead, these examples will be transcribed using a format based on the one suggested by Liddel and Johnson (1989). Each entry begins with an English gloss of the sign. Next, the sign is represented by a series of movements ("M") and holds ("H"). For each hold, the location, orientation and hand configuration are also noted. Below this transcription, an English description of the sign is given next to a picture of the sign. For example, the sign for GIRL would be transcribed as shown in [10].

[10] GIRL

H		M	M	M	H
[ipsilateral jaw]					[ipsilateral chin]
[palm in]					[palm in]
[open A handshape]					[open A handshape]

The dominant hand begins in an open A handshape with the thumb on the ipsilateral side of the jaw. The thumb traces along the jaw line to the ipsilateral side of the chin, then moves back up to the jaw and then returns to the ipsilateral side of the chin.

3.3 Presentation of Data

The phonetic complexity of a sign may be thought of in terms of the total number of handshapes used to articulate the sign, the total number of hands used to articulate the

Section 3.1 outlines the properties of ASL that make a phonetic distinction between verb categories more likely in ASL than it might seem in other languages. Section 3.2 introduces some new notation that will be needed in discussion of individual lexical items at a phonetic level. Section 3.3 presents several possible phonetic means of separating the two groups of verbs along with relevant data, although none of them are able to successfully make broad predictions about verb categorization.

3.1 Why phonetic analysis is reasonable

In most spoken languages, the phonetic form of a word is not related to the word's meaning. The meaning of the English word *look* is not related to meanings associated with the individual phonemes that make up the word; in English, phonemes do not carry any sort of meaning.

In ASL, however, there are several instances of individual phonemes or features of phonemes that carry meaning. Handshapes can carry meaning. Several verbs whose meaning is associated with sight or seeing use the *V*-handshape, which seems to represent the eyes. These verbs include the signs for *LOOK-AT*, *READ*, *GLANCE* and *STARE*. Movement paths can also carry meaning. The same movement path is used in a number of signs for nouns that represent groups, including the signs for *FAMILY*, *GROUP* and *CLASS*. These signs vary only in their handshape. Given the close ties between the phonetics and other areas of ASL linguistics, it is not unreasonable to think that there could be a phonetic distinction between directional and non-directional verbs. Further, it would not be surprising to find that phonetic complexity was a limiting factor in a verb's ability to change its phonetic form based on its arguments. For example, the sign for *TRADE* involves two hands moving in opposite directions at the same time. It is possible that the

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2.2.5 Summary

This section has given a cursory overview of the signs and structures found in American Sign Language. The use of space in ASL was described for indexing noun phrases, for classifier predicates, and for the formation of some verbs. In addition, the different types of predicates that appear in ASL sentences were introduced. The distinction between directional predicates and non-directional predicates will be of particular interest in this paper. The following sections seek a means of predicting whether a given verb will act as a directional predicate or a non-directional predicate. First, possible phonetic prediction features are explored.

3.0 Phonetic Analysis

This section explores the possibility that there is a phonetic distinction between directional and non-directional verbs. The first set of data for this study was obtained from an online dictionary of ASL and from several textbooks of ASL. Words were chosen to represent a variety of semantic properties. Because ASL dictionaries are not always consistent in including information about the directionality of verbs, Rebecca Weinberger and Donna Jo Napoli confirmed the analyses of these words. Although not native signers, both have extensive experience communicating with native signers and could provide fairly confident interpretations of the dictionary descriptions of the generally basic signs examined here. Further data was elicited from Rebecca Weinberger by asking her to express various propositions in ASL in an attempt to elicit data that would counter the conclusions drawn from the initial set of data. A full list of the data analyzed in this paper is given in Appendix B.

letters called "indices" represent points in space. An index following a noun phrase means that the point in space labeled with that letter is associated with that noun phrase. An index at the beginning of a verb represents the starting location of the verb. An index at the end of a verb represents the verb's ending location. Thus, the directional verb *HELP*, whose subject is associated with point a and whose object is associated with point b, moves from point a to point b:

[7]   J-O-H-N$_a$ $_a$HELP$_b$ M-A-R-Y$_b$
John helps Mary.

Some directional verbs only change their phonetic form based on their object. The sign for *TELL*, for example, always starts at the signer's mouth and then moves to the location associated with the verb's object. In this case, no subscript is used at the beginning of the verb, but a subscript is used at the end of the verb to show that the ending location of the verb can change:

[8]   J-O-H-N$_a$ INFORM$_b$ M-A-R-Y$_b$
John informs Mary.

Finally, some verbs do not change their phonetic form based on any of their arguments. The sign for *LOVE* is always articulated in the same way, regardless of what points are associated with its subject and object. In transcribing these "non-directional" verbs, no subscripts are needed:

[9]   J-O-H-N$_a$ LOVE M-A-R-Y$_b$
John loves Mary.

Interestingly, ASL does not seem to have any transitive verbs which agree with their subject but not with their object.

[5]   J-O-H-N LOVE M-A-R-Y
John loves Mary.

Finally, ditransitive verbs have both a direct object and an indirect object that must be specified:

[6]   J-O-H-N LOAN M-A-R-Y BOOK
John loans Mary a book.

The nature of different verbs in ASL will be the focus of the remainder of this paper. The next section looks at a method for categorizing verbs based on their movement paths. The remainder of this paper will address the properties and predictability of these verb categories.

2.3 Movement-Based Description of Verb Categories

In addition to classifier predicates, two general classes of verbs are recognized in previous literature: directional verbs and non-directional verbs (Humphries, Padden and O'Rourke 1994). Some ASL verbs change various parameters of their phonological form based on the location in space that is associated with one or more of their arguments. In some directional predicates, the starting or ending point of the predicate's movement changes based on its subject or object. In others, the hand orientation used in articulating the sign changes based on the predicate's subject or object. The signs for *HELP* and *HATE* are examples of these "directional verbs." The sign for *HATE* changes its orientation so that the back of the hand is always facing its subject and the palm is always facing its object. The sign for *HELP* always begins at the location associated with its subject and ends at the location associated with its object. For this type of predicate, the points in space that represent the starting and ending points of the verb's movement need to be represented in the verb's transcription. In transcriptions of these examples, subscript

representing the table can then represent the spatial relationship between the cup and the table (Costello 1994)[8]:

[3]

Classifier handshapes exist to represent noun categories like vehicles, people, containers, long flat objects, thin objects like wires, etc. In addition to spatial relationships between objects, classifier predicates can be used to describe the shape of an object or to represent an object's path. In the latter case, the movement path that the hand follows is the path that the object being described moves along, while the shape of the hand represents the object itself. To show that a car drove down a hill, the 3-handshape would be used to represent the car and then the hand would move along a path representing the path that the car took down the hill.

2.2.4 Verb Phrases as Predicates

Finally, an ASL predicate can consist of a verb phrase. Like English, ASL has verbs that can be analyzed as intransitive (RUN), transitive (LOVE), and ditransitive (LOAN). Sentences with an intransitive verb may consist of just a noun phrase and the verb:

[4] J-O-H-N RUN
John runs.

Strictly transitive verbs take exactly one object and must be followed by one noun phrase:

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[8] All images used in this paper are from the *Random House American Sign Language Dictionary*; some, like this one, have been edited to illustrate the exact points raised in this paper.

teachers. In ASL, no verb is expressed overtly in this type of statement; the same proposition is conveyed through the concatenation of two nouns, as shown in [1].[7]

[1] M-A-R-Y TEACHER
Mary is a teacher.

2.2.2 Adjectives Phrases as Predicates

Likewise, adjectives phrases in English can appear as predicates with *be* (as well as with verbs like *seem*, *appear*, etc.) Again, ASL differs from English in that no intervening verb is used when an adjective appears as a predicate. The ASL format of a sentence with an adjective as a predicate is given in [2].

[2] M-A-R-Y HAPPY
Mary is happy.

2.2.3 Prepositional Phrases as Predicates: Classifiers

Prepositional phrases can be used alone in English predicates to describe locations and positions: *The cup is on the table*. Many of these types of propositions are represented in ASL with a type of predicate known as a *classifier predicate*. Classifier predicates consist of a movement root but do not specify the handshape that should be used in articulating them. Instead, the handshape(s) used depends on the noun class that one or more of the predicate's arguments belong to. A *B*-handshape represents flat objects, while containers are represented by a *C*-handshape. To express the above proposition once the cup and the table had been introduced in the discourse, one hand is placed in a *C*-handshape to represent the cup and the other hand is placed in a *B*-handshape to represent the table. Placing the hand representing the cup on top of the hand

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[7] Following the standard format used in literature on ASL, English glosses of individual ASL signs will be given throughout this paper in small caps. Fingerspelled signs (words that are spelled out one letter at a time with the ASL letter signs) will be glossed in small caps with dashes between the letters.

signing space in the direction of the referent's chest is used. In addition, an arbitrary location is assigned for each referent that is not present by identifying the referent and then pointing to a point in space. Once assigned, this location remains constant for the remainder of the discourse[6]. For example, if a signer signs *J-O-H-N* and then points to his left side, then John becomes associated with the signer's left side. For the rest of the discourse, this point will be associated with John.

The location associated with a referent is used in a variety of contexts. Pronouns, reflexives and possessives all point to the location associated with a referent. In addition, some predicates change their location and/or their hand orientation based on the locations that are associated with one or more of their arguments.

2.2 Types of predicates in ASL

The most basic propositions in ASL consist of a noun phrase and a predicate of some sort. Like English, ASL allows a variety of lexical types to appear as predicates. In particular, noun phrases, adjective phrases and verb phrases can appear as predicates in both ASL and English. In addition, ASL has predicates that can express many of the ideas that English would convey through prepositional phrases.

2.2.1   Nouns Phrases as Predicates

In English, noun phrases appear as predicates in sentences with verbs like *be, seem*, and *appear*. These sentences include examples like *Mary is a teacher* and *They are*

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[6] The number of referents that can be identified in a single discourse is theoretically unlimited, although in practice it may be limited by practical/memory constraints (Lillo-Martin 1986).

Individual signs in ASL consist of one or more handshapes, a hand orientation (which describes the direction that the palm of the hand faces), and one or more locations that the sign passes through. The handshapes used for ASL signs are named after the letters and numbers that the handshapes represent; Appendix A gives a full list of the basic handshapes used in ASL signs and their names. The following sections discuss some of the properties of individual lexical items and complete phrases in ASL. Section 2.1 looks at the use of space in ASL. Section 2.2 describes the different categories of predicates that can appear in ASL and discusses basic sentence order, and Section 2.3 looks at a means of categorizing ASL verbs based on their movement paths.

2.1 The Signing Space

The "signing space" in ASL describes the region in front of the signer where most signs are articulated. This region extends as high as the top of the signer's head and as low as the signer's waist. It also extends to each side of the signer by slightly less than an arm's length (Valli and Lucas 2000). The place in the signing space that a sign is articulated can carry lexical and/or grammatical (syntactic) information. One way that this is done is by associating locations in the signing space with people and objects that have been introduced to a discourse.

Each entity that is part of a discourse in ASL is assigned to a location within the signing space. For a first-person referent, this location is the signer's chest. For a second-person referent, or for a third-person referent that is present[5], the spot at the edge of the

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subject pronouns that are dropped, but does not discuss them in any depth. Again, though, the context in which this pro-dropping can occur is not immediately relevant.

[5] This assumes that the referent is easily indexed. It is possible that a person who is present but not located in one place for the duration of the discourse might be treated in the same way as an absent third-person referent.

grammar is known as Signed Exact English or Manual English (Wilbur 1979) and is not the same as grammatical ASL.

ASL is generally analyzed as an SVO language[2]. Unlike English, however, ASL is a topic-comment language like Chinese; the NP that is being discussed is frequently introduced to the discourse first and then described or discussed second (Lillo-Martin 1991). For example, the English equivalent of the ASL proposition meaning *I give you the book* would translate more literally as *The book, I give you*. In addition, ASL is a pro-drop language like Italian or Spanish (Lillo-Martin 1991). At least in certain contexts, the subject of a predicate does not need to be expressed overtly[3]. In Spanish, the proposition *I run* can be expressed as either *Yo corro* ("I run-1st-person-singular") or as simply *Corro* ("run-1st-person-singular"). Likewise, at least some predicates in some situations can be expressed in ASL without explicitly indicating the subject of the predicate. In fact, ASL also allows predicates to be articulated without overt expression of their objects in certain conditions[4].

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[2] Other word orders are possible, but most theories assume that SVO is the underlying form. Because this issue is outside the scope of the issues examined in this paper, all examples given here will follow this order, with the understanding that other sentence structures are possible in ASL and that these must be addressed at some point by any theory adopted.

[3] There is quite a bit of disagreement among theorists over the best way to characterize the contexts in which subject pronouns can be dropped. According to Huang (1984), in some languages, it seems to be related to syntactic agreement, while in others it may be more closely tied to topicalization. Lillo-Martin (1991) posits that both methods are active in ASL, while Bahan et. al. (2000) argue that only syntactic agreement is relevant. For now, it is only important to recognize that there are times that predicates can appear alone without any overtly expressed subject.

[4] Very little has been written about the conditions in which object pronouns can be dropped. Lillo-Martin (1991) suggests that they can be accounted for in the same way as

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1.0 Introduction

This thesis[1] explores the nature of the categorization of predicates in American Sign Language (ASL). In particular, the distinction between directional and non-directional predicates is examined. For some types of verbs, this distinction is found to be predictable through an exploration of the phonetic and semantic features of predicates in each category. The implications of this finding are discussed with respect to theories that tie directionality to syntactic agreement features.

Section 2 of this paper provides relevant background on the basic structure and format of ASL, including a discussion the characteristics that distinguish directional predicates from non-directional ones. Section 4 looks at potential phonetic distinctions between directional and non-directional predicates. In Section 5, the directionality of some verbs is found to be predictable based on semantic features. Section 6 explores the implications of this predictability for two syntactic theories of ASL. Finally, Section 7 discusses conclusions that can be drawn from this paper as well as possible directions for further study.

2.0 ASL Background

Signed languages like American Sign Language differ from spoken languages in that information is conveyed visually through the hands, face and body rather than aurally. When looking at ASL, it is important to remember that ASL is a language completely distinct from English. Combining ASL signs using English word order and

The Nature of Verb Categories in American Sign Language

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