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A Prosodic Model of Sign Language Phonology.

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Notes

Chapter 1

1. I am referring here to a moment in the evolution of language after the move toward using the auditory/aural channel as the primary mode of communication had already been accomplished.
2. See Anderson 1993, Corina and Sandler 1993, Brentari 1995, and van der Hulst and Mills 1996 for interesting overviews of historical and methodological approaches to sign language phonology, and for additional discussion on current themes in sign language phonology and their contribution to phonological theory as a whole.
3. This strategy for discussing spoken language units was also used by Uyechi (1995).
4. These affixes may take the form of prefixes, suffixes, or parafixes that occur as simultaneous layers with the stem.
5. This definition of selected fingers does not always consistently identify them, but it does so in the majority of cases. It does not identify forms in which the thumb contacts the body and does not move, while other fingers do not contact the body and do move (e.g., BUG, FINE [intensive], EJACULATE).
6. As Supalla and Newport point out, both the noun and the verb may be derived from a stem form, not specified as a noun or a verb, which appears as the verb form on the surface.
7. The verb forms on which such loci occur, their distribution, and their phonetic realization vary from one sign language to another.
8. Engberg-Pederson calls all of these deictic systems “time lines,” but each has a different function, and not all are related solely to time itself; this is why I speak of them here as “deictic lines of reference.”
9. It is not clear whether this compound is a VA, NA, NV, or VV compound, since NAME (the noun) and CALL (the verb) both come from the same stem, as do SHINE (the verb) and SHINY (the adjective), which even have the same surface forms.

10. The form in figure 1.15 contains nine morphemes, but this may not be the maximum number of morphemes per syllable.
11. Locke (1993) uses the term *prosody* to refer to aspects of language such as stress, rhythm, and intonation. This use of the term can refer to continuously varying aspects of the signal, which may assist young babies in identifying their mothers' voices and can help all listeners in identifying affective states. In work by Halle and Vergnaud (1987) and Hayes (1995), prosody is the set of grammatical properties investigated in metrical theory, such as stress and prominence. These uses of the terms *prosody* and *prosodic* play less of a role in the Prosodic Model, but represent areas into which it can and should be expanded (see Miller 1996).
12. See, however, the analysis of disyllabic forms in chapter 5; an underlying level and a surface level are insufficient to account for these forms.
13. Three-dimensional computer graphic analysis of normal and apraxic subjects' production of the ideomotor gestures from the Boston Diagnostic Aphasia Exam (Goodglass and Caplan 1972), such as carving a turkey, reveals that when normal subjects execute these gestures, joint rotation is systematically coordinated, whereas apraxic subjects' gestures lack this coordination (Poizner et al. 1990).
14. The citation form is the form one might find in a dictionary, or the form elicited when one asks, "What is the sign for 'x'?"
15. It is an interesting fact that in executing the sign for TO-SIGN-Italian Sign Language, -Sign Language of the Netherlands, -German Sign Language, -Langue des signes québécoise, and -ASL, this orientation of the two hands is used. The ASL sign for TO-SIGN-ASL has an alternating, outward directional movement and handshape change with palms oriented toward the midsagittal plane. Not all of these signs use the same handshape (i.e., Italian Sign Language uses a '3' handshape), but the signs for TO-SIGN in Langue des signes québécoise, German Sign Language, Sign Language of the Netherlands, and Italian Sign Language have an alternating circular movement with palms pointed inward.
16. The physiological facts outlined in this section were first discussed by Crasborn (1995).
17. There is one more contact discussed by Liddell and Johnson (1989), known as 'web' (e.g., FOOTBALL, PREGNANT, WRESTLING), but because H_1 contacts the ulnar side of each finger of H_2 , 'web' can be treated as a subclass of 'ulnar.'

Chapter 2

1. This is a paraphrase of the following passage: "The lexical entry for *telegraph* must contain just enough information for the rules of English phonology to determine its phonetic form in each context; since the variation is fully determined, the lexical entry must contain no indication of the effect of context on the phonetic form." Despite the subsequent debate about how abstract such representations should be, this remains one of the most explicit statements of what underlying representations ideally ought to include.

In this book the terms *underlying representation* and *input structure* are considered equivalent to *lexical entry*.

2. What is “simple,” according to *SPE*, is evaluated by the criteria of “learnability” and “formal simplicity.”

3. In the statement, “In our treatment, boundaries are units in a string, on a par in this sense with segments” (*SPE*, 371), only morphological boundaries are at issue. In *Lexical Phonology* (Kiparsky 1982), boundaries do not behave as phonological elements; instead, they regulate word-building operations. In constraint-based models, both phonological and morphological boundaries are visible (e.g., the phonological word vs. the morphological word).

4. For further discussion of Local Constraint Conjunction, see Smolensky 1993 and Fukazawa and Miglio, in press.

5. In this book I use the older, more familiar terms for these constraint types, even though FAITHFULNESS has been replaced by IDENTITY, PARSE by MAXIMIZE, and FILL by DEPENDENCY (McCarthy and Prince 1995).

6. Within Optimality Theory, an account of cases of opacity has been proposed by McCarthy (1997).

7. The number of syllables is equal to the number of sequential movements.

8. I am grateful to the participants at the University of Trondheim Workshop on Sign Phonology (November 1994)—in particular, Irene Greftegreff, Wendy Sandler, Harry van der Hulst, and Lars Wallin—for helping me to crystallize this discussion.

9. Chinchor (1978) was the first to discuss a syntagmatic definition of the sign syllable.

10. Stack (1988) and Hayes (1993) have argued the position that movements play no role in the phonology.

11. Some readers may think that *sonority* is a spoken language term applied to sign languages inappropriately; it is intended to capture the role that perceptual salience plays in both signed and spoken languages, and is not tied to any particular phonetic realization of that salience.

12. Both CVC and CVV syllables are considered heavy syllables here, even though there are languages that call for an analysis of CVV syllables whereby the two vowels are both part of the nucleus.

13. I am aware that languages differ with respect to heavy-light distinctions, but I want to use the simplest case to make my point.

14. Lowercase letters represent feature bundles.

The movement connecting ‘b’ to ‘c’ is inserted by a rule of Movement Epenthesis, which is not relevant here.

15. GO-TO and ASK are a minimal pair in the HM Model, but there are only a handful of such pairs.

16. The Hand Configuration tier includes orientation, whereas handshape in Stokoe's model did not. Battison (1978) was the first to add orientation as a fourth phonological parameter.

17. Perlmutter (1992) does not discuss DANCE; I have extended his analysis to cover forms containing only a movement.

Chapter 3

1. Sandler argues that handshape has the properties of many-to-one association (e.g., two handshapes to one location in the sign UNDERSTAND), stability (e.g., the handshapes in one pronunciation of DON'T-LIKE remain stable, even though the other parts of the sign change), and morphological status (e.g., classifier handshapes are morphemes).

2. Wilbur (1993) uses the term *articulatory tier*, but she includes all of orientation, location, and handshape in the group of features dominated by this node.

3. In the sign EITHER (Long 1918) the H₂ handshape 'V' spreads to H₁.

4. The terms *aperture change*, *handshape contour*, and *allophonic handshape change* are equivalent and are used interchangeably in this book.

5. The 'animal face' classifier handshape, often cited as problematic for previous analyses of handshapes, can be handled in this system. The selected fingers are specified as having quantity features in a dependency relation, [one] dominating [all], and the point-of-reference feature is [mid]. The pinkie finger and index finger are nonselected fingers and are redundantly specified as [extended]. FRESHMAN and SOPHOMORE are specified with the same feature structure as the '7' and '8' handshapes, respectively, except that the nonselected fingers are open.

6. In the form HA-HA-HA, the extended thumb might also be a remnant of the fingerspelled 'A'.

7. This specific set of cases supports Sandler's (1996b) claim that the extended index finger is (at least one of) the least marked handshape(s). In the Prosodic Model, since [one] forms have a nonselected fingers specification and a feature specified under the fingers₀ node, they are not structurally the least marked form as Sandler claims.

8. *X*, *y*, and *z* are simply convenient labels. In mathematics, planes are defined either in terms of the plane in which two lines intersect (e.g., the *x/z*-plane, the *y/z*-plane, the *y/x*-plane) or by the set of points in the plane perpendicular to a particular line. The frontal, horizontal, and midsagittal planes are defined in the Prosodic Model by the points in the plane perpendicular to the line that refers to that dimension in space.

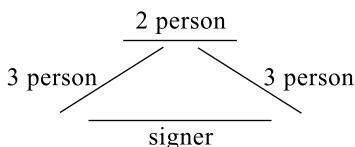
9. The idea of treating the body and the head as separate articulatory spaces was first discussed in Johnson 1994, and many of the places of articulation are adopted from Liddell and Johnson 1989.

10. For example, one place of articulation not exploited in ASL is the armpit, but this place is used in Langue des signes québécoise in the sign STUDENT.

11. Liddell and Johnson (1989) discuss one more contact, known as ‘web’ (e.g., FOOTBALL), but because H_1 contacts the radial side of each of the H_2 fingers, ‘web’ can be treated as a subclass of ‘ulnar’.

Chapter 4

1. TELL also has a [direction] feature, which will be discussed later in the chapter.
2. As noted by Uyechi (1995, 127), direction of circular paths is not contrastive in ASL.
3. A large number of signs have an [arc] movement that is the result of the elbow’s execution of a straight movement, specified as a [direction] feature (e.g., TELL, GIVE, LOOK-AT, SEE).
4. Recall from chapter 2 that the native lexicon is made up of the core lexemes, the classifier predicates, and the manual alphabet.
5. This form of CALL is used in utterances such as “Call me Diane.”
6. In Japanese Sign Language these two verbs are a minimal pair for [direction].
7. English, by the way, does not typically encode the subordinate conceptual function overtly.
8. The back of the hand is either the base of the hand or the back of the hand, depending upon the orientation specification for the particular sign.
9. A reflexive verb form discussed by Meir (1995) has no counterpart in ASL, so I have no comments on this part of her analysis.
10. The representation of aperture changes and the nondominant hand have not yet been discussed, so they are not shown here.
11. When the subject is 2sg, the plane in which the reference locus is specified is a distal x-plane rather than a proximal x-plane. When the subject is 3sg, the possible x-planes in which the reference locus is specified form 60° angles to the x-plane associated with the signer’s body:



12. I have found no signs articulated in a midsagittal plane that are specified for proximal and distal settings.
13. In Brentari 1990b the constraint is stated as follows: “There may be a maximum of one [–peripheral] handshape per prosodic word.”
14. Handshape assimilation from the second stem to the first, a common operation in compounds (Sandler 1989), has not occurred in these forms; rather, one of the handshapes of the handshape contour has been deleted in the first stem.
15. In Brentari 1990b,c I used the feature specification [peripheral] to capture the fact that fully open and fully closed handshapes are unmarked, but the feature geometry proposed here makes this specification unnecessary.

16. This constraint is violated in some fingerspelled loan signs (e.g., E-S-Y ‘easy’ and E-R-L-Y ‘early’).
17. This section summarizes the findings presented in Brentari 1996b. I wish to thank Robert E. Johnson, Scott Liddell, David Perlmutter, and Carol Padden for discussions and correspondence concerning the structure of the polymorphic forms considered in this section.
18. The abbreviation *TM* comes from the term *trilled movement* (Padden and Perlmutter 1987) and from the abbreviation *TIM* (*trilled internal movement*) used in Sandler 1993c.
19. ‘Rubbing’ is included as a TM involving aperture change because it is produced with repeated changes in handshape from flat to closed, in addition to a thumb position change from opposed to unopposed.
20. There may actually be two types of closing. One would include changes in aperture, in signs such as MILK, where the fingers have the same specification for [spread] throughout the sign; the other would involve changes in the specification for [spread], in signs such as SAND-CRAB and CUT-WITH-SCISSORS.
21. There are other nonmanual signs that include rapidly repeated lip movements, such as one transcribed as ‘bi, bi, bi’, but the morphological role of these movements is less well understood, and only ‘tongue wagging’ will be discussed here.
22. This achievement of a target need not involve contact (i.e., touching another articulator); ‘tremor’ may take place in the neutral space in front of the signer (e.g., TOILET).
23. In the table, prose descriptions of various types of aspectual morphology are given. The labels for grammatical aspects used in Klima and Bellugi 1979 cover only a subset of these forms; it is with caution that I use square brackets as a way of noting the aspectual categories (e.g., [internal apportionative], since differentiating among these aspectual categories is sometimes difficult.
24. See Ebbinghaus and Hessman 1996 for a few exceptions to this claim in German Sign Language.

Chapter 5

1. Position segments in the μ Model and Location segments in the HT Model are considered roughly equivalent.
2. There are forms (e.g., LOCK, APPOINTMENT) that appear to be counterexamples to the right-to-left direction specified in the ALIGNMENT constraint. In these cases, the addition of a handshape change can be seen as a type of phonetic enhancement of the circular path movement; in both of these cases, a variant of these signs without the handshape change in the first movement exists.
3. The H₂ portion of the representations in (5), (6), (8), and (9), not included there, will be explained in chapter 7.
4. The shape of the first movement is not at issue here, so REMOVE (with two straight movements) and GOVERNMENT (with a circle and a straight movement) have been grouped together.

5. I have renamed Perlmutter's rule of Mora Insertion as phrase-final lengthening because even though I agree with the generalization of the facts he discusses, my analysis differs from his on two points. First, Perlmutter claims the environment is word-final, but it is in fact phrase-final; no lengthening occurs phrase-internally in this context (see Brentari 1990c for further discussion). Second, I disagree with Perlmutter about the timing unit needed for this lengthening operation.
6. In Brentari 1996b I called this [protractive/inceptive] aspect, but after discussing these forms with linguists studying Athapaskan languages, I concluded that [delayed completive] describes their use more accurately.
7. Davies (1983) proposes that the tongue wag and the finger wiggle are both structural components of the [protractive] aspect (i.e., the form in which the TM occurs throughout the movement); however, either part is sufficient to carry the relevant meaning.
8. There are still points of divergence among these models in the formulation of static units, but these are not addressed here. Also, the segments in question would have to be accessed after Tier Conflation in the HT Model, as described in Sandler 1993b.
9. It is important to point out here that Tier Conflation alone will not result in the correct surface distribution of handshapes-to-path movements when there is a mismatch in the number of handshape changes and path movements (e.g., DESTROY).
10. Weight units are described in chapter 6.
11. The form of ITALY used in this experiment was the older ASL form articulated at the forehead, not the newer form borrowed into ASL from Italian Sign Language.

Chapter 6

1. The terms *inherent sonority* and *derived sonority* are used differently here than they are in Goldsmith and Larson 1990 or in Goldsmith 1991, where *inherent sonority* refers to the sonority of a given feature (or segment) in isolation, and *derived sonority* refers to the sonority of a feature or segment within its local domain.
2. I do not, as Corina (1990b) does, claim that the form without phonetic enhancement, PERPLEXED(1), is ungrammatical; rather, I note that the enhanced forms are more commonly seen.
3. An exception can be found in Edmondson 1990, 1993.
4. The input form for the noun and the verb is taken to be the same here, following Supalla and Newport 1978 and Brentari 1990c,d.
5. This is a summary of one section of Brentari 1994.
6. I will postpone arguments for the ranking of these constraints until chapter 8, since they require introducing material extraneous to this discussion.

7. It is quite possible that there is a morphological/semantic component to the analysis of these forms as well. It is probably no accident that the forms that undergo nominalizing reduplication are all of a single semantic class; namely, each form has a specific handshape representing either a size and shape specifier or an instrument classifier, both of which contain detailed information about the object involved in the event.

8. Many other alternations involving movement repetition have been called reduplication (e.g., Uyechi 1995), but reduplication is defined here as an operation involving a single copy of a portion of the base, as it is defined in spoken languages. Other types of movement repetition—for example, in activity nouns and some grammatical aspect forms that involve many (often an uncountable number of) repetitions—are analyzed as using a [TM] feature.

9. Two possible counterexamples that belong in the set of signs in (18) are LEARNING (derived from LEARN) and ACQUISITION (derived from GET); both of these signs appear in some ASL dialects.

Chapter 7

1. I would like to thank the students at the Linguistic Society of America Summer Institute at the University of New Mexico, 1995, and participants in the sign language workshop at the annual meeting of the German Linguistic Society, Göttingen, 1995, for their helpful discussion of these issues. An earlier version of this chapter appeared as Brentari 1996a.

2. The term *rhyming* is used to describe the relationship between WHITE, BEAUTY, and INSIDE, because all features of these signs are the same except for place of articulation. In particular, the handshape and handshape changes are the same in all three signs.

3. Battison (1974) and Padden and Perlmutter (1987) consider WD to be a unified phenomenon, and this is also the position taken here.

4. Of course, when one hand is occupied, all signs can be made one-handed. The phenomenon analyzed here is one-handed variants of two-handed signs that are considered fully grammatical under normal signing conditions.

5. Both DEFEAT and REVENGE have also undergone additional restructuring of movement.

6. The relation between H_1 and H_2 in the structure proposed here bears similarities to the relation in the structures proposed by Ahn (1990), Wilbur (1993), and van der Hulst (1996).

7. These are representations of maximal structures. For example, not all type 1 signs are specified [symmetrical]; when no orientation feature is present in two-handed signs, the orientation is 'identical'.

8. Labeling this relation between H_1 and H_2 as "head-dependent asymmetry" was first proposed in van der Hulst 1996.

9. Thanks to Lorna Rozelle for pointing this sign out to me.

10. Since Padden and Perlmutter (1987) address only [alternating], not [contact], the analysis here does not contradict their findings, but instead extends them in a particular direction.

11. There is a great deal of dialectal and even idiolectal variation regarding which signs have acceptable Weak Drop outputs. In this section I discuss forms that have a high degree of acceptance among the native signers I have surveyed.

12. Van der Hulst (1996) analyzes H₂ as a weak prosodic branch of structure, making no further claim about whether this weak branch is of the syllable or of the prosodic word.

13. The account proposed in van der Hulst 1996 is quite similar to the one proposed here.

14. This is an optional operation. Often the one-handed sign in the first-stem position remains one-handed.

Chapter 8

1. The HM and the HT Models are the only ones discussed here because my goal is to clarify the insights of the Prosodic Model with respect to the two models that are most widely used.

2. Van der Hulst (1993) and Wilbur and Petersen (1997) also propose a two-slot timing structure.

3. Perlmutter (1992) treats movement as a higher-order prosodic unit as well; but see chapter 6 for relevant points of similarity and difference between the Prosodic Model and the model proposed by Perlmutter.

4. Only native signers or Deaf individuals who have been signing since 2–4 years of age should be consulted as linguistic informants. This is absolutely necessary when lexical innovation data are gathered.

5. There are other types of forms that undergo nativization, such as nonmanual elements and forms from other sign languages, but those types of borrowings are not addressed here.

6. Open, bent, flat, and curved joint specifications for handshape are analyzed in chapter 3; these are merely descriptive labels here.

7. Given the Prosodic Model's view that in the fundamental signing position the hands are oriented toward the midsagittal plane, this operation is quite natural.

8. In current versions of Optimality Theory, FAITHFULNESS is a family of constraints called IDENTITY (McCarthy and Prince 1995), but here I use the older, more familiar term FAITHFULNESS.

9. Two explanatory remarks about this well-formed candidate are in order. First, the movement realized in the output form is a trilled movement—namely, flattening. Second, '8' is a conventionalized, shorthand way of notating a handshape with the middle finger selected and nonselected fingers open. The handshape change [open], [closed] with this set of selected fingers indicates an output form that rapidly changes from having all of the fingers extended (just like 'B') to one

where the middle finger is flattened. The extended index finger approximates the 'D'. This handshape change within the form became a handshape merger in which the [extended] nonselected fingers result in the 'B' and 'D' of 'bread' and the selected finger [mid] rapidly opens and closes.

10. This definition purposely leaves aside classifier predicates, which combine movement roots and affixes (Supalla 1982).

11. There is a set of derived signs that do not contain a movement (e.g., STARE).

12. The term *equivalent* means that the respective visual and auditory stimuli are processed by the magnocellular subsystem (i.e., the "fast" subsystem, discussed in subsequent paragraphs) in both vision and audition.

13. This type of minimal pair can also be expressed in the HT Model and in recent revisions of the HM Model.

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