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Major information from a "minor parameter":
Point of Contact in sign language phonology*

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Introduction. The phonology of sign language (its formational level: Battison 1974) is stated in terms of parameters: several characteristics of a sign which, taken together, constitute a distinctive description of the sign.<1> Four parameters are usually considered: the Location at which a sign is articulated, its Movement, the configuration of the hand (Handshape, Figs. 1 and 2), and the hand's Orientation in space. In the first sign language phonology, Stokoe (1960) considered Location, Handshape,<2> and Movement sufficient to distinguish signs; later Battison, Markowicz, & Woodward (1975) found that Orientation was sometimes also necessary. Klima, Bellugi, Newkirk, & Battison (1979; hereafter "KBNB") call Handshape, Location, and Movement "major parameters" and list Orientation among the "minor parameters": "subclassifications of hand configuration ... [that] distinguish limited sets of minimal pairs, yet further differentiate signs" (p. 45). The values that a parameter may have, comparable to phones or phonemes, are called primes (KBNB 1979:40; Bellugi, p.c. in Battison 1974:4). Handshapes are named according to their use in the manual alphabet and number system of American Sign Language (ASL); primes of other parameters are named with descriptive words or phrases. Although this paper is based on data only from American Sign Language, the analysis should be valid for all sign languages of deaf communities.

Battison (1978:32-36; 1974) discovered two word structure constraints in ASL that apply to lexical signs that use both hands. The Symmetry Condition states that if both hands move independently, they must share Handshape, Location, Movement, and Orientation. "Share" in this context allows Location, Movement, and Orientation to be either identical, as in the sign SINCE (both hands move forward from the right<3> shoulder), or symmetrical, as in SPAIN (each hand moves forward from its own shoulder).<4> The Dominance Condition states that if the Handshapes are different, then (a) one hand must be a stationary base for the other hand's movement (or at most may move only as pushed or pulled by the active hand), and (b) this stable basehand is restricted to one of seven relatively unmarked Handshapes, called "neutral Handshapes". These allowable base Handshapes are shown in Fig. 1. (Note that, unlike the Symmetry Condition, the Dominance Condition does not mention Orientation. In fact, some basehands do need to be specified for Orientation.) The effect of these conditions in limiting articulatory and perceptual complexity is obvious: either the hands do the same thing, or one is stationary and has a simple shape.

These two conditions distinguish three types of two-handed sign (Table 1). The signs that have both hands moving fall under the Symmetry Condition, and share all four parameters: examples are DIALOGUE, MINGLE, ALLOW, and BUILD (Fig. 3).^{<5>} These are Battison's Type 1. Signs whose hands have different Handshapes obey the Dominance Condition, with a neutral base Handshape: for example, LIGHT-A-MATCH, VOTE, and BROADCAST. Signs like these make up Type 3. In the middle are the signs subject to neither Condition, those with both Handshapes the same and one hand stationary: for example, WINDOW, CAN'T, and NAME. These are Type 2.

KBNB(1979:45-50) list three minor parameters in all: Orientation, Hand Arrangement, and Point of Contact.^{<6>} Point of Contact (PC) is the part of the hand, such as palm or fingertips, which touches another surface. It is an important component of the feel of a sign. It describes the tactile portion of the signer's proprioceptive feedback, which is arguably as important as visual feedback in monitoring one's own signing (Stokoe 1978:82-85). The arguments to be presented here, however, are based on statistical and absolute (i.e., exceptionless) prediction of one parameter of a sign from other parameters, and the corresponding determination of a least-marked prime or feature value in a phonological environment.

Oddly, PC is the only parameter not recognized at all in Stokoe's analysis.^{<7>} Almost all notice taken of PC has been in terms of other parameters, often as part of one of them. Friedman first introduced PC in 1976 as part of Orientation, using it instead of the hand's attitude in space in signs where the hands touch the body or each other: in this environment the hands do not conform to Stokoe's defining terms for orientation, the three cardinal axes of the body (up-down, left-right, and front-back), but rather to the surface being touched. Battison (1978:37) cites an observation of Richard Lacy's (p.c.) that more-frequent Handshapes have more PCs than less-frequent ones. Wilbur (1979:56) found PC necessary in the derivation of the [A] Handshape from underlying /S/, and noted the lack of proposed features for PC as a measure of the small attention paid to this parameter. Anderson (1981) uses "focus" (similar to PC) for contact and direction of movement in his morphophonemic analysis (cf. below, "PC and deixis"). And most recently, Boyes-Braem (1981)'s morphophonemic analysis of Handshapes includes features to associate a PC with a Handshape (though without analyzing PC itself).

Base Handshapes in Type 3 signs. Newkirk has claimed that the Handshape of a basehand can be predicted from its PC (KBNB 1979, fn. 8, citing Newkirk 1978). This is true, but only subject to a caution, a restriction, and an exception. The caution is that we must choose an appropriate set of PC primes. Then, since the basehand of a Type 2 sign is the same as the active Handshape, which can be any Handshape at all, we must also restrict this prediction to the neutral basehands that occur in Type 3 signs, or

we will find ourselves trying to predict highly marked non-neutral Handshapes (Fig. 2) from their PCs -- a generally impossible task, since the latter are a proper subset of those of the less-marked Handshapes (cf. Lacy's observation). The exception will come up later.

Newkirk's observation captures a redundancy that is not easily expressed in a phonology without underlying PC. Basehand B occurs with contact on the palm and the edge of the hand, and more markedly on the fingertips. G has contact on the tip and the middle of the finger and along its entire length. And S has contact on the end of the fist, the back, and occasionally the palm and knuckle surfaces. If (as I will demonstrate) PC predicts Handshape in a certain environment but not vice-versa, then PC in a sense includes Handshape in that environment, and carries more information about the sign.

Battison listed seven neutral Handshapes that can appear in the basehand. The magic number shows up again as the number of PCs that occur on basehands in Type 3 signs (Table 2, columns 1-2; Fig. 4).<8> PCs are majorly divided by the feature Space: Inside and Angle are [+Space], while Palm, Side, Back, Shaft, and Tip are [-Space]. Contact with a [+Space] PC is defined as being within its defining volume, not necessarily physically touching the hand.

The lax hand predicted by Back-of-hand PC is rather peculiar. For one thing, it seems to vary more often and more freely than the other base Handshapes. For another, it does not occur in the active hand, or only very rarely -- WOW! can be said to have it -- which is probably why Stokoe did not consider it a Handshape and Battison omitted it from the neutral Handshapes, although it clearly satisfies the Dominance Condition. This is a difficult situation for a generative phonology of ASL, because basehand is clearly a neutralizing environment compared with active hand, and you don't want to posit an underlying prime that occurs only in neutralizing position. Underlying PC eliminates this theoretical awkwardness.<9>

I promised an exception to Newkirk's claim, and here it is. One common basehand is left unaccounted for by PC: besides occurring in variation with B and lax hand in the environment of Back-of-hand contact, S (the fist) is also very frequent as an invariant base Handshape with Side contact: for example, HELP and SODA-POP (Fig. 5). This combination of Handshape and PC, I claim, is specified underlyingly just for Handshape, with the single feature [+Closed]. In this environment Side PC (end of the fist) is predicted as the unmarked value.<10>

Why should the system of PC and Handshape have this one exception? Well, consider that all the other neutral Handshapes have visually salient geometrical forms which, taken as Points of Contact, are unique to those neutral Handshapes and so predict them (Table 2, column 3). None of these forms appears on any other neutral Handshape.<11> But S is compact and has no such salient parts, and this very fact makes it unique among the neutral Handshapes. We capture that quality by specifying it as a

Handshape: the unmarked [+Closed] Handshape, with nothing protruding. This compact shape can contact on the Back or the Side, or very rarely (in basehand) on the Knuckle. The simplicity imposed by Battison's Dominance Condition is now enforced by limiting the basehand to a single specification -- either a Point of Contact or one Handshape feature value -- from which the remaining values are derived. (As in Battison's analysis, some signs still require basehand Orientation to be specified as well.)

Battison's Dominance Condition allows no non-neutral Handshape in the basehand of a Type 3 sign, and Newkirk's claim and my discussion so far imply that to each PC (with the exceptions of Back and S) there corresponds just one Handshape. In fact, non-neutral Handshapes do appear, and a single PC may occur with more than one Handshape. We can accommodate this variety by introducing markedness. Each PC predicts a particular Handshape in the unmarked case; any other Handshape must be explicitly specified, at the cost of additional features. These additional specifications may produce another neutral Handshape or a non-neutral one. With the Handshape features in Table 3 (based on Mandel 1981), the common variant Handshapes for each PC differ from the unmarked one by a single feature specification. For instance, SHIT has Inside PC with [+Closed] Handshape (S instead of O); a variant form of CATCH-SOMEONE has Shaft with [+Thumb] (thumb \bar{A} instead of G); and a variant of BEGIN has Angle with [-Uniform] (V instead of 5).

Basehand PC as Location. Stokoe treated the back of the hand (combined with the back of the wrist) as a Location; now all Type-3-basehand PCs look like Locations. Like shoulder, chin, and other Locations, they are distinguishable landmarks or regions of the body, with the difference that the part of the body they belong to is flexible and moveable. The hand changes shape to highlight the PC to the viewer and make it easily accessible for the signer; Inside PC does not exist at all till the fingers are bent. To achieve the same purposes, the hand also moves to the center of neutral space if it is not already there, just as the moveable wrist, forearm, and elbow move toward the same place when used as Locations. Slow-motion videotape analysis shows that the basehand is formed and positioned before the active hand is ready to articulate the sign (Judy Kegl, p.c.): it becomes part of the body, a pre-existing given for the active hand. The hand's moveability also allows it to vary its Orientation, as torso Locations cannot do and the forearm could do but rarely if ever does significantly (in non-compound signs; see below).

The PC of the basehand in a Type 3 sign relates differently to the basehand itself and to the active hand in the sign: for the active hand it functions as Location, but within the basehand it is parallel to PC on active hands, making some of the same predictions about Handshape and some predictions that are different but regularly related (see below). Orientation is likewise a parameter of the basehand, but as far as the active hand is concerned the basehand's Orientation is a given of the

Location. The arguments in the preceding paragraph would suggest that basehand PC be treated as part of the Location parameter, but the basehand's double status -- a hand to itself, but a part of the body to the active hand -- precludes so simple a solution.

In Stokoe's original analysis of ASL phonology (1960) all the characteristics of a sign, or "aspects", were considered to be simultaneous: the articulator, the location, and the action. In his positional notation, he handled the basehand's double status by using symbols from the articulator inventory for the basehand's handshape and possible orientation (the latter originally borrowed from the action inventory), and writing them in the location slot. The principle of simultaneity survived the later reanalysis into four or more parameters, which Stokoe has never accepted (1978): for instance, Battison's Conditions are conceived in a simultaneous analysis (1978:28-36). But there is evidence, like the lag between basehand and active hand formation, suggesting that signs have an internal sequential structure. Several researchers have developed sequential analyses of ASL phonology and morphology (Ellenberger 1977, Chinchor 1978, 1981, Kegl 1981, Gee & Kegl 1981, Barss 1981). From a sequential point of view, first the basehand sets up its PC and then the active hand uses that as its Location.

Symmetry in Type 2 signs. Recall that Type 2 signs fall between Battison's two Conditions, having one stationary hand and two identical Handshapes: STOP, NAME, DOOR. The analysis presented above, in which Type 3 basehands are redefined in terms of PC, raises a possibility: Maybe some Type 2 basehands are also underlyingly specified for PC, and just happen to come out to the same Handshape as the active hand. Take STOP, for example (Fig. 6). It has a basehand, and the same B Handshape on both hands, so it belongs to Type 2. But the basehand has Palm contact while the active hand has Side contact. Partly as a result, the Orientations are different too. Considering this asymmetry, STOP looks as though it could well be closer to PAY and BUTTER (which are Type 3, also with contact on the basehand Palm) than to such symmetrical Type 2s as SCHOOL and ANYWAY (which, like STOP, have B-Hands), or to NAME (with H's) and FINAL (with I's). How can we test this possibility?

The B of STOP, SCHOOL, and ANYWAY is a neutral Handshape; the H of NAME and the I of FINAL are not. In NAME, FINAL, and all other non-neutral Type 2 signs, the hands are symmetrical: they share PC and Orientation. Suppose this is a general characteristic of "genuine" Type 2 signs. We also find that some Type 2s with neutral Handshapes are symmetrical as well, but that many others, such as STOP, SUPPORT, and IN, are not (Fig. 7): just what we would expect if some basehands are specified for PC rather than Handshape. Evidently there are two kinds of Type 2 signs: symmetrical, "genuine" ones like ANYWAY and FINAL, whose hands share PC and Orientation as well as Handshape, and asymmetrical "crypto-Type 3s" like STOP and IN, whose basehand is independently specified for PC, as it is in Type 3. Since

specification of a basehand for PC can only produce a neutral Handshape, as it does in Type 3, non-neutral basehands are found only in "genuine", symmetrical Type 2s.

The distinction between basehand and active hand, which has been central to the analysis so far, exists only in Types 2 and 3. In Type 1 signs, like BUILD and PERMIT, we can distinguish the hands as dominant and nondominant: in right-handed signing the right hand is dominant and the left is nondominant.<12> When there is a basehand, it is always the nondominant hand; when a sign has only one hand, for instance FUNNY and SUNSHINE, it is always the dominant hand. In Type 1 signs, like BUILD, the hands share Handshape, Location, Orientation, and Movement, as well as PC if there is contact; in symmetrical Type 2 signs, like NAME, the Handshape, Location, Orientation, and PC are also shared, but the nondominant hand has no Movement of its own. The nondominant hand of an asymmetrical Type 2 like STOP also has no Movement specification of its own, but it is underlyingly specified for PC, and the PC produces a Handshape that matches the dominant hand. And Type 3, for instance BUTTER, is just like asymmetrical Type 2 except that the nondominant Handshape comes out different from the dominant.

A new typology. Symmetrical Type 2s group with Type 1, asymmetrical Type 2s group with Type 3 (Table 4). We seem to have a new typology, with two classes, alongside Battison's 1-2-3 classification. In Type A, the symmetrical class, the nondominant hand is specified in terms of the dominant; in the asymmetrical class, Type B, it is independently specified. Battison's Type 1 goes into Type A, Type 3 goes into Type B, and Type 2 -- the leftover type, falling between the Symmetry and Dominance Conditions -- is split. We can use both typologies at once and call its subtypes 2A and 2B. Now we can reformulate the Symmetry and Dominance Conditions:

Symmetry: If the nondominant hand is specified in terms of the dominant, then it will share the dominant's Handshape, Location, Orientation, and PC (if any), and may either share Movement or have none. (Type A.)

Dominance: If the nondominant hand is not specified in terms of the dominant, it may be specified only for PC or the single Handshape feature value [+Closed], and optionally also for Orientation. (Type B.)

(Like the prediction of base Handshape from PC, these constraints should not be taken as absolute but as describing the least-marked cases. The same is true of Battison's original formulations of the Symmetry and Dominance Conditions.)

So we have a new classification of two-handed signs. What can we do with it that we can't do in any older analysis? Well, we can constrain the set of possible signs and limit patterns of variation and change.

The original Dominance Condition allows some nonsigns that the PC version correctly rules out. For example (Fig. 8), a nonsign with the edge of the active B coming down onto the side of

the fist of a base G, and one with the thumbtip of an active thumb tapping the palmar side of a base A, are impossible as signs -- or highly marked -- because the PC of the basehand doesn't match the Handshape.<13>

Phonological variation in signs often crosses class divisions in the 1-2-3 typology. One frequent kind is "lazy hand" variation between Types 1 and 2A. The Type 2 variant may compensate for the stabilization of the nondominant hand by enlarging the movement of the dominant (as Anderson 1978, to whom I owe the name "lazy hand", has also observed), but otherwise it is identical. By neglecting PC, the 1-2-3 grouping misses the fact that Type 1 signs often develop Type 2A variants but seldom if ever cross the A-B division to vary with Type 2B. (See Fig. 9.) So we get Type 1 and Type 2A INTERPRET with the joined thumb- and index-tips of the two F-hands together (Tip PC, Handshape [+Opposed, -Uniform, -Closed]), but no starred form with the active hand's tips inside the circle formed by the basehand's thumb and index (basehand Inside PC). We find AMAZED with the two bent hands (palm-up dominant beneath palm-down nondominant) tilting apart in a vertical plane from their initial Tip-contact (Type 1), and with the dominant hand dropping from initial Tip-to-Tip contact with the stationary nondominant (Type 2A), but not with the palm-in active hand dropping down and forward from initial contact of its Tip with the Knuckle of the palm-down basehand. And ANYWAY, with B-hands palm-in and side-by-side with Tips touching, has a Type 1 form with both hands brushing back and forth past each other and a Type 2A with the dominant hand brushing the stationary nondominant, but does not have a Type 2B in which the nondominant's fingers point up and the dominant Tip brushes its Side (pinky-edge): this is a possible sign, but not an expected phonological variant of a Type 1.

Handshape assimilation sometimes brings Type 3 signs into Type 2. RESIDENTIAL-SCHOOL (Fig. 10), originally a Type 3 sign, has an assimilated Type 2A form in which the basehand has turned from prone to semiprone Orientation. In the older form, the nondominant hand is specified only for Back PC, which implies Palm-down Orientation. Under the revised Dominance Condition it is costly to specify both Handshape and PC on the basehand, and the Symmetry Condition requires the nondominant hand to share Orientation as well as Handshape (and, in the revision, PC) with the dominant. So the newer form is symmetrical: retaining the older Orientation and PC would have been more costly. The earlier formulations of the Symmetry and Dominance Conditions do not predict this change: they would allow the basehand to remain Palm-down with Back PC while changing to I Handshape.

PC in active hands. PC has predictive power on active hands as well as basehands. Tip contact on the active hand most often has the G handshape (e.g., THINK and PAY), just as in basehands, and Palm contact similarly most often has B (MY and ENTHUSIASTIC). But the Handshape predicted by a PC is not always the same. Angle contact predicts [+Uniform] 5 on the basehand but [-Uniform] V on

the active hand. A similar difference appears with Tip contact on [+Opposed] Handshapes: on the basehand this combination always produces [+Uniform] O, but on the active hand it produces O and [-Uniform] F with equal frequency.<14> While the Dominance Condition imposes on the basehand a strong preference for Handshapes in which the fingers act uniformly -- G is the only exception -- the active hand allows non-uniformity, and may in fact prefer it.

PC without contact. The hand need not actually touch the other surface for PC to be meaningful. For one thing, contact varies with near non-contact both sociolinguistically and stylistically (Friedman 1976). But beyond that, ASL has nonphysical Locations: points and surfaces in the signing space (Friedman 1975, Supalla 1978a, KBNB 1979, Newport 1981). A hand can phonologically contact these Locations, as evidenced by Movement (Supalla & Newport 1978, KBNB 1979) and by Handshape: WASH-HORIZONTAL-SURFACE (with A) contrasts minimally with MOW-LAWN (with S), sharing the same Palm-down Orientation and back-and-forth Movement. [A] is not an underlying Handshape (except in loans from fingerspelling), but is derived from /S/ in the environment of Palm PC (Wilbur 1979:56), as here, or from /thumbÅ/ in the environment of Dorsal Shaft PC.<15> It is explainable here only if WASH-HORIZONTAL-SURFACE, but not MOW-LAWN, is articulated in contact with a nonphysical horizontal plane. This would be entirely compatible with the Location-incorporating morphology of WASH, which can be variously articulated on the trunk ('bathe'), the face, the side of the head ('wash the hair'), a nonphysical vertical surface, and so on, as well as on a basehand for a semantically unspecified location. (I am indebted to Hartmut Teuber for this example.)

Apparent Dominance violations and the issue of simultaneity. Some compound signs that appear to violate the Dominance Condition are regular when viewed sequentially. Many Handshapes occur as classifiers, nominal morphemes referring to a semantically or visually defined class of objects: e.g., 3 for a vehicle, B for a wide flat object, and G for a long thin object. Numeral Handshapes also function as plural classifiers: V and L for dual, 3 for trial, 4 for quartal, and 5 for quintal or multiple. (See Chinchor 1981 for a detailed analysis of numeral-incorporation.) Classifiers are incorporated into verbs of motion and location, producing a verb complex that predicates that motion or location of an object in that class. (For further data and theory see Frishberg & Gough 1973, Mandel 1977, Supalla & Newport 1978, Supalla 1978a and b, Mandel 1981:Chap. IV, and Gee & Kegl 1982.) When classifiers are used on basehands, apparent Dominance violations arise. Two examples of this large and productive class are SMALL-ANIMAL-JUMPS-ONTO-FENCE, with Side PC on a 4 basehand, and SECOND-OF-THREE with index-finger-Tip PC on a 3 basehand (Fig. 11). (Thanks to Judy Kegl for the following analysis.)

In compounds like these the lag between the formation and placement of the basehand and the formation of the active hand is on the order of the duration of a sign and clearly visible to the unaided eye, suggesting that it belongs to syntax rather than word phonology. The "basehand" forms not just a Location (its PC and Orientation) but a separate sign, with which the "active" hand then articulates morphosyntactically. SECOND-OF-THREE would thus be better analyzed as a phrase --

[dom. : THE-SECOND-ITEM
 nond.: THREE-ITEMS.....

-- " (of the-~~mentioned~~-)THREE-ITEMS THE-SECOND-ONE ". The nondominant hand makes one sign to establish the context -- this sign is one-handed, and the hand that makes it is active and by definition dominant in the sign, though nondominant in the larger discourse. The discursively dominant hand then articulates literally "in" that context, making another sign which carries the new information.

This analysis is supported by the frequent retention of such a basehand sign through a fairly long stretch of discourse, several sentences or even more, during which it may be used many times. For example, speaking of five siblings<16> (references shown with numbers are located on the thumb through pinky tip of the basehand 5): "#1 moved out years ago; he's gone to Illinois. I'm #2. #4 and I are real close, but #3's real stuck-up. #5 is the baby of the family; #4 lends clothing to her all the time." Such a stretch can contain one-handed signs, in which the retained basehand plays no part, just as body Locations (forehead, chest, etc.) are uninvolved though physically present during signs that do not use them. In two-handed signs not involving the basehand sign, the basehand may retain its Handshape while the active hand articulates on it, deforming that two-handed sign (but recoverably; cf. Battison 1974:9). Or the sign may be made normally, terminating the maintained sign, which will be set up again if needed later. The basehands of one-word signs such as ESTABLISH and WORD cannot be retained and used in this way: if signs in sequence happen to require the same nondominant Handshape, it will be maintained, but as soon as it is not needed the hand will relax and may drop out of signing space. In a sequential analysis like this, "signs" like SECOND-OF-THREE and SMALL-ANIMAL-JUMPS-ONTO-FENCE are not exceptions to the Dominance Condition at all, because they are not single words but phrases. The full word boundary within them is evidenced by the timing between the component signs, and the word structure constraint expressed by the Dominance Condition holds only within each word.

PC with Orientation and Movement. I have already mentioned Friedman's (1976) use of PC to simplify the description of Orientation. The present analysis looks the same in that respect, except that it treats PC as a separate parameter rather than a subset of Orientation, and does not require specification of all parameters.

PC simplifies the description of the Movement parameter as well. Two of Stokoe's Movement primes, grasp and enter, translate into the present analysis as contact by (respectively) the dominant and nondominant hand, on either the Inside or the Angle: grasp in EARRING, CATCH-SOMEONE, and APPLY, and enter in VOTE and APPEAR.<17> These Movement primes, and no others, also have a special use to describe the initial contact of the hands, as in ESCAPE and SPIRIT. As the use of underlying PC eliminates grasp and enter, this exceptional use is reduced to simple onset contact with Inside or Angle, just like onset contact with the forehead (NOT-KNOW) and the Back of the hand (SEND). One handshape, bentV, can grasp with either its Inside (CATCH-SOMEONE) or its Angle (TICKET); underlying PC disambiguates the description. In mutual grasp both hands have a [-Space] PC: Inside in COOPERATE (linked F's) and MARRY (C's grasp each other palm-to-palm), Angle in FOOTBALL (interlaced 5's) and PLUG-IN (interlaced V's).

ASL has a number of deictic pronouns, which are usually described in terms of Movement, Handshape, and Orientation. Their Movement is controlled by the person, number, and placement of the referents, or of the nonphysical Locations used for referents that are abstract or absent, or whose true location is unknown or ignored (Friedman 1975, Baker & Cokely 1980). Their Handshape depends on the type of the pronoun: simple, numerical, possessive, honorific, emphatic/reflexive, or neuter demonstrative. The hand's Orientation and Movement are partly dependent on the Location -- the hand "points" toward it -- and partly dependent on the type of pronoun, not on the Handshape itself (Table 5). The diversity in deictically-oriented parts of the hand is directly captured by treating these parts as PCs. Each type of pronoun is specified for PC, and in some cases also for one or more Handshape features and/or for Orientation (such as Palm-up). The Handshape will be phonologically derived from the PC (and the Handshape feature specifications, if any). Note that the most frequent, semantically least-marked pronoun types, simple and possessive, have the simplest specifications, deriving Handshape from PC alone.

The place of PC in phonological theory. How should PC fit into a systematic analysis of sign language phonology? It acts as Location, predicts Handshape, substitutes for or partly controls Orientation, and replaces some Movements; it has been called a feature of Handshape (Boyes-Braem 1981) and of Orientation (Friedman 1976), one of six (KBNB 1979) or eight (Mandel 1981) separate parameters, and almost totally ignored (Stokoe 1960, Stokoe, Casterline, & Croneberg 1965); considered a minor (KBNB 1976) or a major (Boyes-Braem 1981) appendage of Handshape and a significant independent characteristic of the sign (Anderson 1981 and the present analysis). Where should it go in a parametric analysis of ASL, let alone a Stokoean aspectual one?

Perhaps parameters are not so critical to phonology as they seem. Certainly many morphological patterns refer to Handshape, Location, and Movement (see, among many, Frishberg 1975, Frishberg

& Gough 1973, Supalla & Newport 1978, Supalla 1978a and b, Klima, Bellugi, & Pedersen 1979, Klima, Bellugi, Newkirk, Pedersen, & Fisher 1979, and Boyes-Braem 1981). It is not surprising, then, that psychophysical experiments have shown signers to be sensitive to them (Lane, Boyes-Braem, & Bellugi 1976, Stungis 1978, Poizner & Lane 1978). But in phonology the features of a sign interact freely across parameters. PC conditions Handshape, Handshape conditions PC (S basehand), Location conditions Handshape ([-Uniform] is more likely in the visual center of signing space than in the outer regions: Siple 1978b), PC conditions Location (in basehands); Directional Relation, Orientation, and PC condition each other in a two-out-of-three triangular relationship (Mandel 1981:14-15, 265). Parameters are a useful organizing principle in morphology, but in phonology they are unnecessary.

Summary. A two-way classification of two-handed signs of American Sign Language, based on underlying specifications, supplements and extends an earlier three-way classification based on surface Handshape and Movement, and allows revision of two major word structure constraints to cover all two-handed signs. The new formulations require underlying specification of Point of Contact, a parameter heretofore generally treated (in various ways) as relatively insignificant, or else ignored. They correctly exclude certain classes of nonsigns that the earlier statements allowed, and they constrain variation more accurately. A sequential analysis shows that another large class of "signs" that appear to be exceptions to the Dominance Condition are actually syntactic constructs of two signs and hence are not constrained by the Condition. The multiple function of PC as Location (in basehand) and as predictor of Handshape, and the phonological interrelationships of all the parameters, suggest that while parameters may be significant in morphology, they have little application in phonology.

NOTES

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1. This discussion is limited to the manual portion of the sign. For non-manual signals see Baker & Padden 1978 and Baker & Cokely 1980.
 2. Not actually just Handshape, but the entire articulator. Stokoe's "cherological" analysis was reinterpreted by later researchers.
 3. Actually from the dominant shoulder; see text below.
 4. Signs are conventionally referred to by fully-capitalized glosses, which should be regarded as convenient tags rather than exact translations. A gloss consisting of several English words is tied together with hyphens.
 5. Generally only the moment of contact is illustrated, but in Fig. 3 the movements of Type 1 and 2 signs are indicated with arrows.

6. Hand Arrangement refers to the number of hands in the sign and, if two, to their use (two moving hands [Type 1], or one moving and one base hand [Types 2 and 3]) and directional relation (one hand above, below, beside the other, etc.). The name "Point of Contact" is from Friedman (1976), who to the best of my knowledge was the first to examine this parameter systematically. KBNB use "Contacting Region" and "Focus". In Mandel 1981 I called it "Focus".
7. Not quite true. The Handshape diacritic defined as "thumb or other digit given added prominence", and normally interpreted as "thumb extended", is used in a literal handful of cases by Stokoe, Casterline, & Croneberg (1965) for thumb contact on a Handshape whose thumb is already extended, such as L (AFTER-A-WHILE) and 5 (FINE, but not MOTHER).
8. One other PC, Knuckle, occurs on the active hand but very seldom on the basehand. On basehands it predicts [+Uniform] S, on active hands [-Uniform] X: see text below on PC in active hands.
9. The lax Handshape itself can be eliminated as a prime by deriving Back of hand directly to S. The Back of the palm-down S will tend to tilt away from the active hand; as the signer attempts to bring it to a more accessible angle the tendon effect (Mandel 1979) will tend to relax the fingers into the lax Handshape.
10. In fact, most of the S-basehands in Type 3 signs are in the unmarked Orientation: forearm midway between prone and supine and wrist about straight. This puts the Sides on top and bottom. Since the unmarked Directional Relation in Type B signs with [-Digit] PC seems to be active hand above basehand, Side contact comes as an automatic result of unmarked values. The phonology does not even incur the cost of a specific rule to derive it, since such "forcements" (Mandel 1981) are logical consequences of the definitions of features and primes. Compare, in spoken languages, the rule pair [+High] --> [-Low] and [-Low] --> [-High].
11. B is the only neutral Handshape with a plane-edge, but every Handshape has a Side that is physically available for contact, even if phonologically forbidden (as in open8). The shape of Side PC varies with the Handshape, but in the environment of basehand it defaults to being straight:
 Hsh [u Extended] --> Hsh [+Extd] / $\left[\begin{array}{l} \text{PC Side} \\ \text{nondominant hand} \end{array} \right]$
 (See text below for hand dominance.) As Stokoe, Casterline, & Croneberg observe, there is considerable variation between basehand B and G with index-edge contact; both of these are [+Extended]. 5, which is also [+Extended], is more marked for Side PC because it is [+Spread] (Mandel 1981:181-182).
12. Frishberg (1979) discusses reversals in dominance. Woodward (1978) describes metathesis of Movement and Handshape between the dominant and nondominant hands, and Mandel (1981:6-8) distinguishes some of those cases as complete role reversals, or dominance metatheses.
13. In fact, the fist-Side of G is probably never specified as PC, but occurs only a result of other specifications and defaults. G on either hand, like basehand S, has fist-Side contact almost exclusively in the environment of two-handed signs where it has neutral Orientation (forearm semiprone), and a Directional Relation (dominant hand above nondominant) which is very frequent and probably least-marked with a basehand. The same is true of X, H, V, I, and Ψ , the other Handshapes that consist of a fist with finger(s) protruding. (Some others -- baby0, bent \check{V} , R, and thumb Ψ -- do not occur at all with fist-Side contact.)
14. [+Uniform] covers two values of the Number of Fingers feature, [0 Fingers] and [4 Fingers]. Within [-Uniform], 1 is least-marked, followed by 2 and finally the highly-marked [3 Fingers]. G and F are [1 Finger]; V, [2 Fingers], costs the same as G and F here because Angle PC ([+Space, -Palmar]) physically requires at least two fingers (unless [+Thumb Contact] is specified as well).
15. As in REMEMBER and SECRET, which formerly (Long 1918) used the Shaft of G rather than of \check{A} . See Wilbur, Frishberg 1976:204, and Mandel 1981:175-179.
16. The example is invented but typical.
17. Stokoe, Casterline, & Croneberg also, rarely, use enter Movement with a Location that is part of the body: e.g., in JEALOUS the Tip of G enters the mouth. This contact is not part of the regular phonological system of ASL, but comes from an older form of the sign: usually contact is at the corner of the mouth. (My thanks to Hartmut Teuber for pointing out to me this usage difference and its consequences for the phonology of the sign.) -- The change is part of

Frishberg's (1976) historical Facial Displacement, which moves Location from the center of the face to the periphery. Rimor, Kegl, & Lane's results (unp.) indicate that the differences found by Frishberg may be due to differences in stylistic register as much as, or rather than, to diachronic change. Since inside-the-mouth contact and other superfine distinctions are still used in some forms of signing, it may be necessary to postulate a more detailed (and possibly less systematic) phonology for these registers than for ordinary fluent signing.

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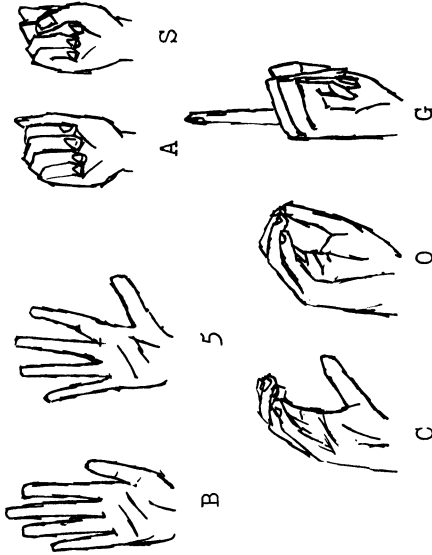
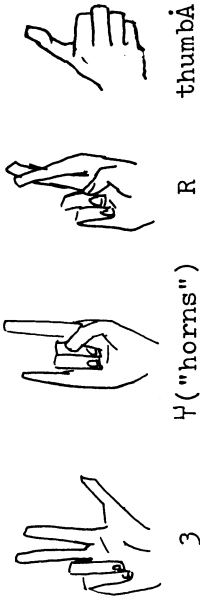
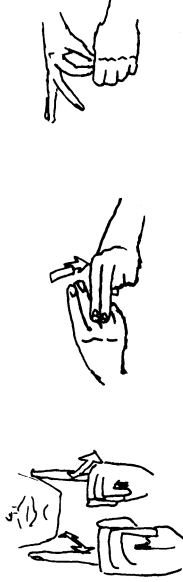


Fig. 1: Battison's (1978) neutral Handshapes

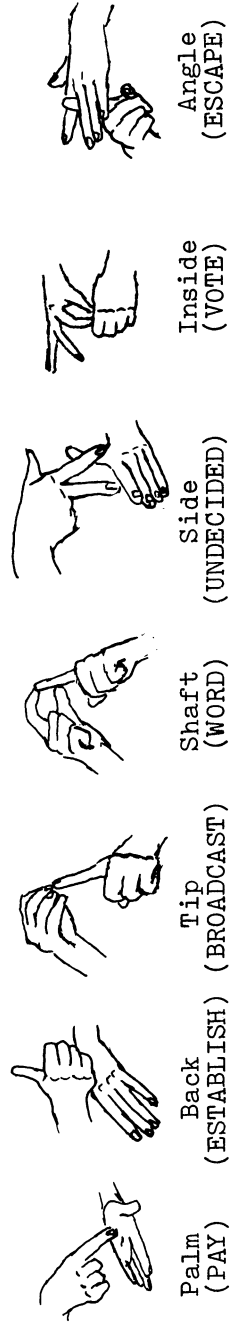


3 Y ("horns") R thumbA
Fig. 2: Some non-neutral Handshapes



1 (DIALOGUE) 2 (NAME) 3 (VOTE)

Fig. 3: Examples of Battison's three sign types



Palm (PAY) Back (ESTABLISH) Tip (BROADCAST) Shaft (WORD) Side (UNDECIDED) Inside (VOTE) Angle (ESCAPE)

Fig. 4: Type 3 signs with PC-defined basehands

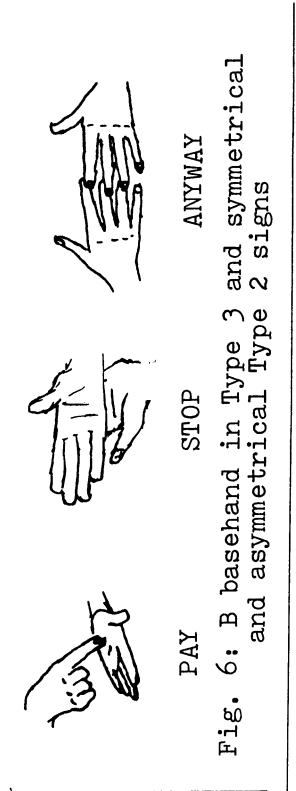


Fig. 5: Side PC on S basehand in Type 3 signs

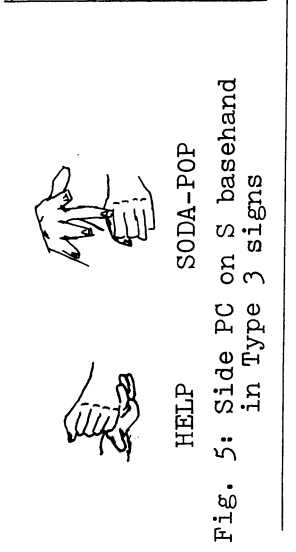


Fig. 6: B basehand in Type 3 and symmetrical and asymmetrical Type 2 signs

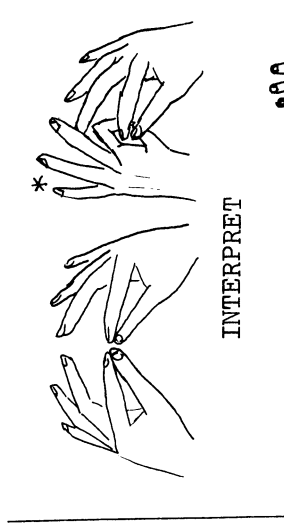


Fig. 7: Asymmetrical Type 2 signs

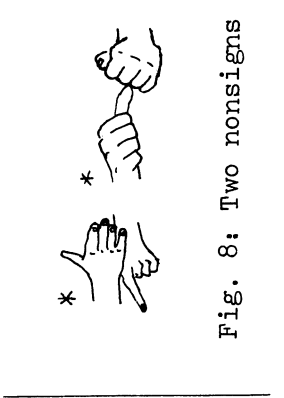


Fig. 8: Two nonsigns

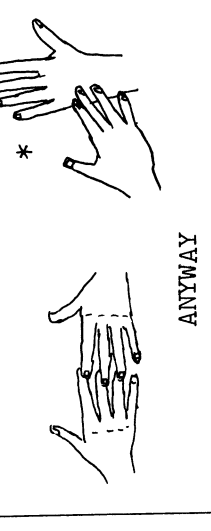


Fig. 9: Impossible variation

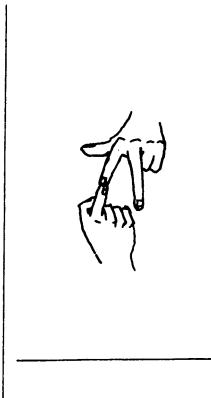


Fig. 10: Variation in RESIDENTIAL-SCHOOL

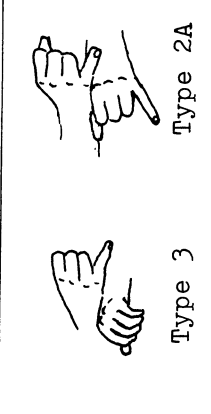


Fig. 11: SECOND-OF-THREE

ANYWAY

INTERPRET

Types 1 & 2A Type 2B

FEATURE DEFINITIONS*
 Space: space between parts of the hand
 Digit: digit(s) used distinctly from body of hand
 Tip: uses digit only at tip
 Palmar: in palmar hemisphere of volume around hand
 Side: radial or ulnar side of part of hand ("edger")
 Distal: in distal hemisphere of volume around body of hand
 Dorsal: on dorsal skin of part of hand

Point Base of Hand-Geometrical Contact shape

Palm	B	plane surface
Side	B	edge of plane
Shaft#	G	line
Tip#	G	point, end of line
Back lax.B,S	convex surface?	
(Knuckle) S	convex surface?	
	(rare in basehand)	

Inside O,C concavity (opening VOTE in a solid)
 Angle 5 gap (opening in a surface)

TABLE 1: Battison's Symmetry and Dominance Conditions and typology of two-handed signs

H a n d	M o v e m e n t	both hands one hand (Symm.Cond.)
		same
s h a	d i f f .	Type 1
		Type 2
a (Dom. Cond.)	p e	*
		Type 3

TABLE 2: Point of Contact primes, features, and basehand Handshape and geometry

#Each digit also has a PC feature. [+Thumb Contact] occurs in some frozen classifier signs; the others are needed only in phrasal "signs" like SECOND-OF-THREE. Features apply to PC on either hand. Circles show a possible set of minimal specifications on basehand, given appropriate markedness conventions.
 #Shaft contacts a surface by lying along it, while Tip contacts perpendicularly or obliquely.

TABLE 3: Handshape features applying to neutral Handshapes

N E C S O	FEATURE DEFINITIONS*
F l p	Number of Fingers: number selected to participate in configuration & in contact (if any). * is [Uniform], covering [0 Fg] and [4 Fg].
G 1 +	Extended: selected fingers are fully extended, all joints straight; Closed: any fingers are closed onto palm
S * +	Spread: any fingers are spread
O * -	Opposed: selected fingers are opposed (unselected fingers never are)
5 * -	*(There are other features, used in non-neutral Handshapes.)

TABLE 4: The two typologies of two-handed signs

Basehand Example	Type 3	S D T P S D D	Point of Contact	Basehand Example	Type 3	S D T P S D D
STOP	UNDECIDED	- - - - -	B	STOP	UNDECIDED	- - - - -
WORD	WORD	- - - - -	G	WORD	WORD	- - - - -
BROADCAST	BROADCAST	- + - - -	G	BROADCAST	BROADCAST	- + - - -
ESTABLISH	ESTABLISH	- - - - +	convex surface?	ESTABLISH	ESTABLISH	- - - - +
		- - - - +	concavity (opening VOTE in a solid)			- - - - +
		- - - - +	gap (opening in a surface)			- - - - +

TABLE 4: The two typologies of two-handed signs

Battison's surface typology	New underlying typology
TYPE 1: Both hands moving, obey Symm. Cond.: share Handshape, Movement, Location, and Orientation.	TYPE A: Nondominant hand defined in terms of dominant: shares Handshape, Location, Orientation, and Movement.
TYPE 2: Escape both stationary, shared Handshape.	Symmetrical (2A)
Conditions: one hand stationary, shared Handshape.	Asymmetrical (2B)
TYPE 3: Handshapes different, obey Dom. Cond.: one hand stationary with neutral Handshape.	TYPE B: Nondominant hand defined independently, for PC ally Orientation; has no Movement.

TABLE 5: Deictic pronoun types

Handshape PC Spec.	Type	Handshape PC Spec.
simple	G	Tip (finger)
thå	Tip (thumb)	Tip
V(=2) Tip	num.	V(=2) Tip
3,4 Tip/none	pos.	3,4 Tip/none
B Palm Tip-up	hon.	B Palm Tip-up
B Tip Palm-up	emph.	B Tip Palm-up
thå none/	neut.	thå none/
Y Palm		Y Palm

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thå none/	neut.	thå none/
Y Palm		Y Palm

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B Tip Palm-up	emph.	B Tip Palm-up
thå none/	neut.	thå none/
Y Palm		Y Palm