

WRITING SYSTEMS AND PROBLEMS FOR
SIGN LANGUAGE NOTATION

1. Introduction

Writing, or more specifically, written forms of representation of symbolic systems, such as language (spoken or signed), permits the communication of ideas over distances of space and intervals of time. These two forms of extension of otherwise ephemeral communication output serve to stretch the memory capacity of those language-users who share writing systems.

Writing affords a means of reproducing a text, presumably unchanged, from one performance to the next. Thus, not only can we extend our memory for meaning or sense of the communication, but also can preserve the precise form of the original presentation, for which memory may degrade over time.

In addition, writing has values not immediately related to the overt, objective task of conveying information, or form of expression. Many cultures have developed specific text forms which are traditionally memorized for preserving the information intact. The act of learning or repeating such material by itself can be a significant cultural event. I am thinking here of the recitation of Oceanic geneologies, Native American medicine songs, and the traditions of mythology and folktale among peoples from Africa and Australia as well. As long as each of these communities remained reasonably intact, and uninterrupted by the social, political, economic, religious and educational influences from the technologized and literate communities of the East and West, those unwritten forms of tradition had unambiguous value. Once interrupted, however, these languages and cultural traditions have been thrown into awkward positions with respect to the legitimizing institutions of government, education and religion. The existence of a writing system (orthography) for the indigenous language offers an external "proof" of the legitimacy of the language. In some cases, the writing system may even validate the existence of the language itself.

The problems confronting the users of sign languages are in many ways similar to those facing users of previously unwritten spoken languages. The sign language may have been assumed to be an informal collection of general and rather concrete gestures, having no status within the circle of human languages. In fact, however, of the specific sign languages which have been investigated to date, all have been found to be complete, complex, precise systems of expression capable of wit and art as well as more ordinary information transfer. Thus, otherwise intelligent persons may deny the legitimacy of sign language in part because it lacks a conventional writing system and the concomitant body of written literature.

The following discussion will consider the problems for designing a writing system for sign languages. In order to properly assess these problems, we will first briefly expand on the notion of sign languages of the deaf. Next, we will review the possible forms of representation available for preserving signed information. The notion of "level of

representation" becomes relevant as we consider the functions for which a writing system is employed. Finally, some comparisons with representation systems for spoken languages will be offered to suggest that the most familiar system may not provide the best model.

1.1 Terminology

As we embark on this exploration, let's agree on some terminology with respect to writing. A language is most often written down using an alphabet or syllabary as its symbol set. The symbol set adopted to capture the relevant aspects of sound production (for spoken languages) is often called the orthography; the set of conventions (i.e., "spelling rules") for the proper usage of that symbol set is also called the orthography. That is, English uses a Roman orthography, Russian the Cyrillic, Korean the Hankul, and Hindi the Devanagari. English orthography requires a capital letter at the beginning of each sentence, and spaces between word units; Devanagari permits whole sentences to be written without a space. This convention does not imply that Hindi users have no sense of what a word is.

A notation system is the term used here to refer to a particular technical orthography or symbol set used to represent the articulatory gestures of the language. The International Phonetic Alphabet is a well-known example of a notation system for spoken languages. The pronunciation guide on the inside cover and foot of each page of a dictionary offers another notation system for rendering spoken productions of the written forms, otherwise given only in the standard orthography.

1.2 On American Sign Language and Other Sign Languages of the Deaf

A brief review of the current understanding of the place of sign languages among human languages, and American Sign Language (ASL) among sign languages, seems appropriate to orient the reader to the issues before us.

Sign languages, especially those used as primary languages by deaf persons, have only recently been recognized by the scholarly community as legitimate, complete, expressive human languages of equivalent structural richness and communicative power to spoken languages. 'Recently' (above) refers to the period of the past twenty years approximately.

Sign languages are not derivative of oral languages, although some borrowing does occur. That is, sign languages do not represent in any direct way the form of the spoken language either by visually representing sounds or syntactic sequences of words of the spoken language. The exception to this general claim is, of course, "finger-spelling" which represents the orthography (i.e., printed spelling representation of the spoken language), or "hand-mouth" systems which represent the sound system of the spoken language (as in Danish Sign Language). Within true deaf sign languages, however, both of these devices have a relatively minor role; in the most extreme case, strictly limited to rendering proper names at the time of first introduction in a discourse.

American Sign Language (ASL) is historically related to several sign languages of Western Europe and can be assumed to be the ancestor of several sign dialects or languages of the Western Hemisphere, despite its relative youth among the world's languages. The first school for the deaf was established in the U.S. in 1816, and this presumably provided the set of conditions affording the development of ASL. Some of those conditions include (i) a continuous proximity of a number of deaf persons of several age groups, including one French deaf man whose acknowledged role was to be the model and teacher of the adapted set of French signs; (ii) the training of deaf persons to continue the teaching of signs within new educational institutions; (iii) the tolerance of signing varieties other than those representing spoken language syntax.

ASL has been determined to be made up of signs (which are wordlike units articulated by the hands and arms), arrayed in spatial relation to one another and on the signer's body, one after the other. The addition of facial expression including mouth, eye, brow, and head movements, and physical gestures of the body, made up of partial rotation of the trunk, forward and back, and side-to-side movement of the body (as well as the previously mentioned spatial relations) have been shown to yield grammatical information crucial to the unambiguous communication of a message, and to the recognition of a signed utterance as authentic or native-like.

Individual signs, unlike spoken words in most languages, are not made up of sequentially realized segments. The most felicitous current analysis of ASL suggests that several simultaneously realized aspects of the sign, generally called its "parameters", comprise the elements that uniquely identify each sign. A particular handshape, when articulated at a specific location with a prescribed movement (in the proper orientation and at the correct point of contact with the body or hand surface) will yield a meaningful sign. This difference between sequential segments and simultaneous parameters need not hinder further analysis of distinctive features which may have a universal significance for languages of each modality; however, it will have implications for the successful development of a writing system or notational set for signed languages. In addition, the proper analysis of the role of non-manual components of signing will have implications for the development of written representations of these elements as well. These non-manual components mentioned above may be used (a) as part of the lexical representation; (b) over a sign or string of signs to show affect; (c) to give sentential force (question, assertion, negation, etc.); (d) to subordinate one signed phrase within a larger utterance; and (e) to give speaker's attitude toward the utterance. For many, though not all of these functions, a writing system may offer concrete mechanisms for representation. For instance, English punctuation often gives a sense of sentential force (question, exclamation, etc.) and may at times show subordination (through use of commas, parenthesis, etc.), corresponding to ASL's non-manual (c) and (d) above. Nonstandard spelling will sometimes indicate some supersegmental or paralinguistic information (e.g., l-o-o-o-o-n-g) about a special spoken form. Nothing orthographic, though, will reveal whether the writer intends the remarks to be sarcastic, sincere or something else. The writing system(s) for Sign Languages may not capture everything in the uttered signal, just as the writing system(s) for spoken languages will not.

2. Representations

By attempting to preserve a sign language performance in any other way than teaching the exact movement arrangement to another human being, we will necessarily achieve a representation of the original.

2.1 Moving Pictures

Among the most obvious and seemingly direct representations for signing are film and videotape. The advantages of these media are that they preserve a particular rendition of a signing performance by a particular individual in a way that permits recognition of the originator of the information. Color film and video have been successful in overcoming a potential disadvantage: color gives the illusion of three dimensions in a two-dimensional medium. Given the proper technical assistance, film and videotape can be slowed for more detailed inspection by analysts. Both media also have the positive attribute of being able to be viewed by a large group at one time, reproducing a performance as a performance, or giving a group a technological "one-way window" to observe signed events which might be disrupted by actually having the group present in the live situation (i.e., mother-child interaction).

Disadvantages of film and videotape include the current high cost of both playback and recording equipment as well as the actual tapes or films. Lack of access to equipment makes many viewers unable to change roles and become transmitters of communication. Storage of the actual films and tapes requires a relatively large amount of physical space constrained as to configuration and factors of temperature, humidity, light, etc. Access to particular segments within a larger signed performance tape may involve bothersome time delays and is still imprecise enough to require quite a bit of attention on the part of the viewer-equipment operator.

2.2 Still Pictures

Related to film and video representations are still photos, drawings, illustrations, and diagrams. Still photographs, like film and videotape, can represent not only the sign performance but also the particular person who gave the performance. The obvious missing element in any of these forms is the parameter of movement, both movement of individual signs and movement between signs. While a succession of still photos might permit general recognition of the intended meaning, this form of representation would not permit the analyst to determine relationships of holding and pausing structures to the viewer's understanding of meaning, nor the details of rhythm, relative placement of the hands, and the several other factors of timing and spatial display which interact to yield complexity in signed discourse.

Drawings -- from life, from photos, or from the imagination -- again can capture a single sign, but with the addition of the illustrator's use of arrows, lines, dots and so on, can augment the picture to show more information than the "frozen" image of the still photo.

When drawings of signs do not show the hands in relation to a signer's body, the representation may be difficult to relate unambiguously to a particular movement configuration. Also, non-crucial aspects of the drawing may become of great importance to the reader who is unfamiliar with the language.

Nonetheless, many text books and technical articles about sign language augment the prose descriptions of signs with still photos, drawings, or diagrammatic illustration. For the knowledgeable signer, these static forms generally will call to mind the intended form. For the naive reader or student of signs, they may inadvertently create confusion. In the following illustrations (taken from O'Rourke, 1973), one can easily see how still drawings, even those with "diacritical marks" such as arrows, dots, or shading drawn in, are difficult to interpret. Those with no body are particularly challenging for the sign-naive individual to interpret (e.g., #58 HERE, #56 ALMOST, EASY, etc.). And these pictures were intended for the student of sign language, not as a reference for the fluent signer.

The illustrations from Bellugi and Klima (1978) on the other hand are intended as technical drawings to accompany a scholarly presentation. Still, it is clear that the interpretability of these drawings depends on some accompanying text, or explanation of the conventions used, or both.

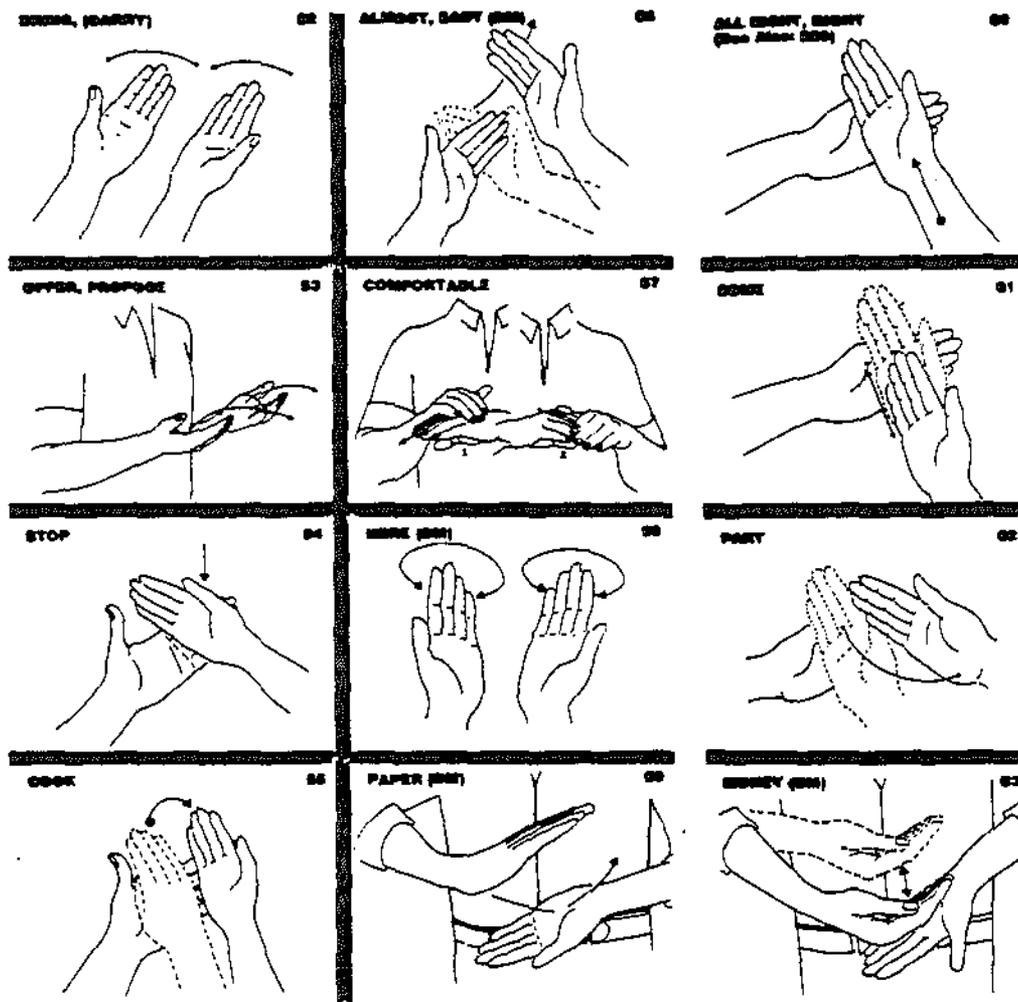
Drawings, still photos and illustrations have several practical disadvantages when considered as writing systems. They are cumbersome -- taking up large amounts of space on a printed page -- and expensive to produce -- requiring a specialist to render each photo or illustration.

This form of representation, of course, is also not available for two-way communication. Not everyone who can recognize the drawing can reproduce it for transmission. One of the great advantages of orthographies for spoken language is that they can be learned as two-way communication systems. With some moderate amount of instruction, a fluent user of a language can become both a reader and a writer of that language. Illustrations, however, would not immediately be able to be rendered consistently by all fluent signers.

2.3 English Glosses

For the researcher in the field of sign language studies, the use of English glosses (or "names" of signs) has served to represent forms under analysis. Even more recently two textbook treatments have introduced sign language students to these glosses, to avoid the pitfalls of still pictures alone, and to circumvent the lack of a uniformly accepted symbolic notation system.

Most scientific research papers about sign language now include the standard footnote that informs the reader about orthographic conventions: that the names of signs will be given in all capital letters, e.g., SIGN (= "sign language"). Where a several word gloss is required for a single sign, the words will be joined by hyphens, e.g., TAKE-ADVANTAGE-OF (= "exploit"). And more recently the use of the symbol '#' precedes glosses which should be read as restructured fingerspellings, or loan



from T.J. O'Rourke. A Basic Course in Manual Communication, 1973.
 Silver Spring, MD: National Association of the Deaf.

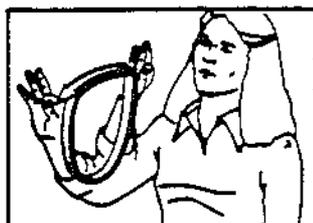


FIGURE 1 (Imperative)
 'speak over and over again'

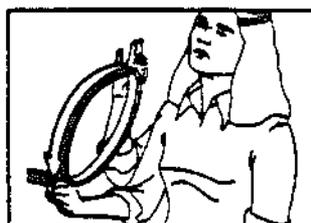


FIGURE 2 (Imperative)
 'speak for a long time'



FIGURE 3 (Imperative)
 'speak to them'



FIGURE 4 (Imperative)
 'speak to each of them'



FIGURE 5 (Imperative Indefinite)
 'speak all over'



FIGURE 6 (Imperative Indefinite)
 'speak among members of a group'



FIGURE 7 (Alternative Indefinite)
 'speak to selected ones at different times'

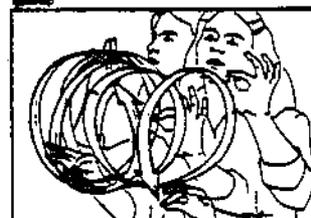


FIGURE 8 (Alternative Indefinite)
 'speak to any and all at different times'

from U. Bellugi and E.S.Klima,
 "Language: Perspectives from Another
 Modality", Ciba Foundation Symposium
 BRAIN AND MIND (December 1978)

signs, e.g., #CLUB (= "deaf social organization") (following Battison, 1979). Klima and Bellugi (1980) introduced the use of a ligature symbol to join the several signs of a compound lexical item, e.g., BLUE SPOT (= "bruise"). Actual fingerspelling is given with either hyphens separating the letters of the word, in lower case or by underlining, e.g., O-R-T-H-O-G-R-A-P-H-Y, orthography, or ORTHOGRAPHY, and so on.

The advantage of this system of English glossing is obvious: hearing readers know how to process this system already; one need only learn the glosses for the necessary signs and communication abounds through time and space. Typewriters, printing and all of the modern paraphernalia of print culture can easily be adapted to this written system.

Perhaps the disadvantages are not quite as obvious. First, a single gloss must be agreed on by all users sharing the system. Currently the Humphries and Padden (H & P) text uses the gloss 'I', while Cokely and Baker (C & B) use 'ME' for the sign meaning the first person singular pronoun. In neither of these texts is the reader intended to use the handshape corresponding to the fingerspelling letter 'i', while articulating the sign; the authors have just adopted different orthographic conventions.

To take these two texts as the examples again, the representation of the sign class, classifier, is slightly different in the orthographic conventions.

H & P use 'CL:B' where C & B use 'B-CL', to show the flat non-spread hand when used as classifier. These written usages are not so different, but the learning of two orthographic conventions can throw even the most earnest sign language student off.

A second disadvantage is that deaf signers are not uniformly fluent in English. This includes deaf persons from other countries as well as Americans. Those whose English skills are less than good will not recognize the signs written in gloss form that they would otherwise know in actual performance. We might consider this a possible teaching technique, not unlike the rendering of Black Vernacular English in Roman orthography, but an adult deaf person need not feel like an incompetent sign reader simply because he or she has not mastered English. For many kinds of written communication, the goal is not instruction, but merely transmission of information or feelings.

In a related way, the glosses that are known or shared already in the deaf community do not always reveal the meaning of the sign as would be expected. COW is the known gloss both for "bovine creature", and for a sign which is made with the same handshape in the same beginning position, but which means "I don't care about it". In fact, of course, there are several ways of expressing the "don't care (for it)" feeling which differ in form, each a separate lexical item. So the gloss representation DON'T-CARE might be recognized by (deaf) signers as any one of several signs.

A third disadvantage is that glossing rapidly loses its ability to represent the relevant portion of the signing stream. As soon as information goes beyond the simple text of the language student, means

for representing the use of two hands, the direction of hand movement (from right to left or left to right, from up to down, and so on), and the angle of orientation of the hands becomes important. Indeed the movement of the hands in repeated cycles is among the most informative to the viewer/reader about the syntax and meaning of complex signs. Klima and Bellugi (1980: chaps. 9 & 10) have developed a system for categorizing the different inflectional movements in signing, but these category names have not been assigned orthographic representations yet in the glossing systems for writing signs.

Lest these disadvantages seem overwhelming, let me suggest that as a writing system for everyday use, glossing serves an important function. We will not lose glossing soon, but it may co-exist with other more notationally efficient and effective writing systems for sign languages.

2.4 Symbolic Systems

Several different approaches have been suggested by dance notators and sign language researchers for using non-alphabetic symbol systems for sign language representations.

2.4.1 Dance Notations

Labanotation, the most well-known of the several dance notations, could easily be adopted for sign language renderings. This writing system would aid researchers and would permit those in other human movement investigations to read sign language work and exchange data with sign language researchers; however, it would not be available to the lay deaf person, nor to the sign language student. In addition, this dance notation, like others designed for whole body movement, focuses on the movement of the feet. Much of the apparatus of Labanotation would remain unused and yet in the stream of writing, while the smaller symbols representing the arms and hands would remain at the extremity of the staff. In a sense, Labanotation is too powerful a tool for sign language, and at the same time, not economical enough.

Similar objections might be raised about the Eshkol-Wachman system of dance notation, which has in fact already been used for the dictionary of Israeli signs (Cohen, Namir and Schlesinger, 1977). My own lack of serious inspection of this dictionary and notation system inhibits further comment at this time.

Valerie Sutton, a dancer and notator herself, has adapted her Sutton Movement Notation system for use with sign languages, first working in Copenhagen and more recently in the United States. The Sutton staff for sign languages includes only three lines, rather than the five required for dance, martial arts or other movements. In fact, the sample given here uses no staff (like printed English uses no lower guide line). Sign Writing by Sutton is relatively easy to learn, permits two-way communication, and has a partial pictorial quality to it.

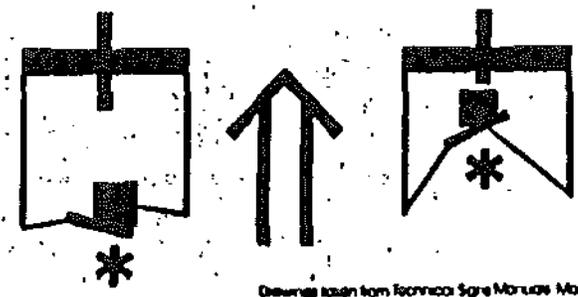
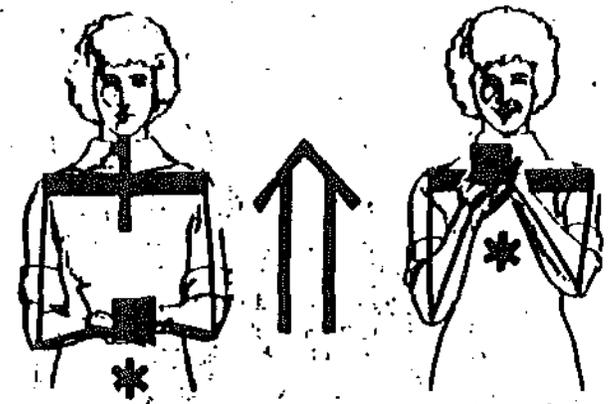
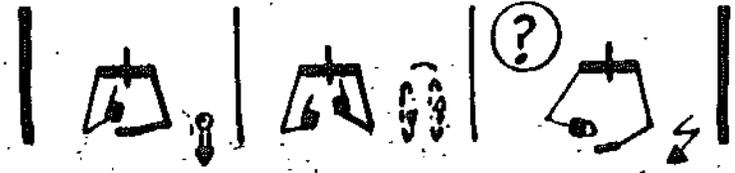
Sutton's Sign Writing shows a stick figure representation of the human body: neck, shoulders, trunk, arms, hands. Where relevant, a head may be added. The hands have several realizations for the distinct

What is

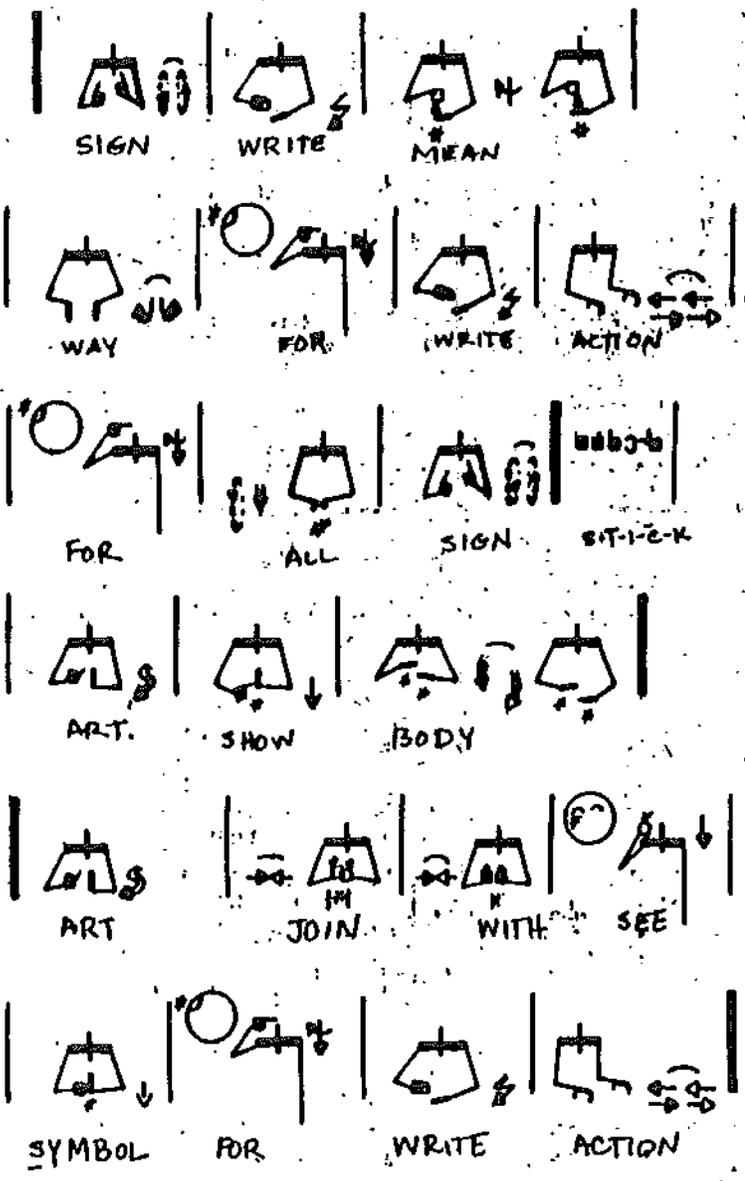
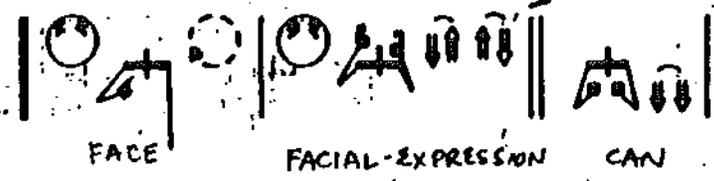
SIGN
 WRITING.

?

Sign Writing®
 is a way to write
 the movements of
 all sign languages.
 It uses stick
 figures that out-
 line the upper
 half of the body.
 These are combined
 with visually de-
 signed symbols to
 write movement.
 Even facial ex-
 pressions can be
 written!



Drawings taken from Focaccia Signe Manuals Manual Two courtesy of the National Technical Institute for the Deaf



shapes, as presented to the viewer. A system of arrows, dashed or dotted lines, asterisks, open or filled arrowheads, and so on, in conjunction with some musical notation symbols, work to represent movement. Additional symbols on the facial circle may show aspects of eyebrow, eye, mouth and cheek movement.

2.4.2 Stokoe's Notation

William Stokoe, of Gallaudet College's Linguistics Research Laboratory, has contributed to the field of sign language studies by creating it. His formative analysis of American Sign Language led to further discoveries about the structure of individual signs and the nature of sign language syntax. His further investigations have offered guidance in the study of sign languages in other countries, and of the relationship between signers and speakers. In this context we focus on his creation of a notational system for writing signs.

Stokoe first proposed the notation system in his 1960 monograph, in which he offered the analysis of each sign into three parts, hand shape (called Designator, or dez for short), location (called Tabula, or tab for short), and movement (called Signation, or sig for short). Presumably, Stokoe offered these technical names in order to separate the realm of sign formation from that of everyday gesturing, and from the description of ordinary human movement without symbolic significance.

Subsequently Stokoe in collaboration with two deaf colleagues wrote A Dictionary of American Sign Language on Linguistic Principles, in which each entry was listed with notation as well as an English gloss. Usage notes or extended meanings given for each entry also make the Dictionary a crucial reference work in sign language studies. The Dictionary lists entries according to their pronunciation in signs, making it truly a signer's dictionary.

Stokoe's system is relatively easy to learn; I have been able to teach small groups of deaf and hearing signers to use the dictionary in anywhere from one to four hours of instruction, depending on the size of the group and their familiarity with alternative writing systems. It can also be written by those who can read it, and thus can serve as a two-way means of communication. Problems with the Stokoe notation system include both major and minor issues.

The universality of the system is one concern. Having been designed to handle American Sign Language, the current inventory of handshapes, for example, leaves out many needed in other sign languages (extended ring finger is one). Presumably as the potential inventory of sign-forms in other sign languages becomes better known, Stokoe's system could be adapted.

There are difficulties in the movement parameter, and the usefulness of maintaining the same inventory of symbols for orientation of the hands has been questioned. Similarly, there are ambiguities of notation for particular types of signs. If the system is intended, as most writing systems are, to be used by fluent members of the language community, then issues such as the angle of rotation for signs employing the '⊙' symbol (circling movement) is no problem; this is determined by the phonotactic

rules of the language. However, the fact that such symbols as 'a', 'o', 'T', 'L' all serve to signal directional movement and change of orientation of the hand that is moving can cause problems in the unambiguous coding of known signs.

Alternative analyses of movement such as have been proposed by Supalla (1978) offer a challenge to Stokoe's system (and for that matter to any of the dance notations also). Supalla holds that there are seven root types of movement in ASL which can be combined to create complex movements. Now, perhaps these are morphologically relevant movements, and one could argue that Stokoe's system is intended only for lexical movement, but surely those lexical items which relate to the actual or metaphoric movement of objects such as Supalla describes must be able to be notated. Supalla's seven movements can all be represented by Stokoe's system, but not without difficulty and not without overlap, apparently.

The expressiveness of Stokoe's system is called into question. Without a doubt, it is essentially impossible to represent relationships between signs, and complex morphological information in any economical way within the Stokoe system as it now stands. However, for simple lexical items, it is often the ideal tool.

2.4.3 Anderson Notation

Lloyd B. Anderson has offered an alternative writing system for American Sign Language with the hope that it will serve as a basis for a more general solution to the problem of writing systems for sign languages.

He begins with the premise that using the familiar Roman alphabet as the symbol set will gain greater acceptance from the signing community who already are familiar with it, and for whom there exists a coding system for Roman letters within their language (namely, fingerspelling). Beyond psychological factors, he considered the ease of printing and producing such an orthography to promote the value of an alphabet-based writing system.

The innovation in Anderson's system is not merely the adaptation of the alphabetic system to new values for sign languages, but also the analysis of sign language movement into both Cartesian values (outward, upward, leftward vs. inward, downward, rightward) and intrinsic values referring to the shape of the articulators. That is, if indeed the Anderson system succeeds, it will be able to capture the morphological and syntactic movement patterns which reveal crucial coreference (or non-coreference) relations within ASL. A writing system for a sign language which cannot display the interrelated movement patterns between signs in the sentence structure cannot be useful beyond the single word level. Anderson's system attempts to systematically show movements that are change of handshape (as part of the lexical shape of the sign), motion relative to handshape, free articulatory movement, abstract pronoun marking by directional inflection, and three-dimensional motion. His initial manuscript has only the barest outline of the system sketched, but the analysis suggests that we might see a Roman orthography for sign languages before long.

Table of symbols used for writing the signs of the American sign language

Tab symbols

1. Ø zero, the neutral place where the hands move, in contrast with all places below
2. ○ face or whole head
3. ^ forehead or brow, upper face
4. ▭ mid-face, the eye and nose region
5. ∪ chin, lower face
6. ∫ cheek, temple, ear, side-face
7. ∏ neck
8. [] trunk, body from shoulders to hips
9. \ upper arm
10. / elbow, forearm
11. Ⓚ wrist, arm in supinated position (on its back)
12. Ⓛ wrist, arm in pronated position (face down)

Dez symbols, some also used as tab

13. A compact hand, fist; may be like 'a', 's', or 't' of manual alphabet
14. B flat hand
15. 5 spread hand; fingers and thumb spread like '5' of manual numeration
16. C curved hand; may be like 'c' or more open
17. E contracted hand; like 'e' or more clawlike
18. F "three-ring" hand; from spread hand, thumb and index finger touch or cross
19. G index hand; like 'g' or sometimes like 'd'; index finger points from fist
20. H index and second finger, side by side, extended
21. I "pinkie" hand; little finger extended from compact hand
22. K like G except that thumb touches middle phalanx of second finger; like 'k' and 'p' of manual alphabet
23. L angle hand; thumb, index finger in right angle, other fingers usually bent into palm
24. 3 "cock" hand; thumb and first two fingers spread, like '3' of manual numeration
25. O tapered hand; fingers curved and squeezed together over thumb; may be like 'o' of manual alphabet
26. R "warding off" hand; second finger crossed over index finger, like 'r' of manual alphabet

27. V "victory" hand; index and second fingers extended and spread apart
28. W three-finger hand; thumb and little finger touch, others extended spread
29. X hook hand; index finger bent in hook from fist, thumb tip may touch fingertip
30. Y "horus" hand; thumb and little finger spread out extended from fist; or index finger and little finger extended, parallel
31. 8 (allocheric variant of Y); second finger bent in from spread hand, thumb may touch fingertip

Sig symbols

32. ^ upward movement
 33. v downward movement
 34. ^v up-and-down movement
 35. > rightward movement
 36. < leftward movement
 37. x side to side movement
 38. T movement toward signer
 39. ⊥ movement away from signer
 40. T movement to-and-fro
 41. Ⓚ supinating rotation (palm up)
 42. Ⓛ pronating rotation (palm down)
 43. ω twisting movement
 44. ∩ nodding or bending action
 45. □ opening action (final dez configuration shown in brackets)
 46. # closing action (final dez configuration shown in brackets)
 47. x wiggling action of fingers
 48. ⊙ circular action
 49. x convergent action, approach
 50. x contactual action, touch
 51. # linking action, grasp
 52. † crossing action
 53. ⊙ entering action
 54. † divergent action, separate
 55. ⊙ interchanging action
- } vertical action
- } sideways action
- } horizontal action
- } rotary action
- } interaction

from Stokoe et al., Dictionary of American Sign Language 1965
Washington, D.C.: Gallaudet College Press.

Using the Notation System
in a Dictionary of American Sign Language
by William Stokoe, Dorothy Casterline, and
Carl Croneberg

1965 Gallaudet College Press reprinted 1976 Linstok Press
Washington, D.C. Silver Spring, MD

TAB (< Tabula) = location orientation represented by
DES (< Designator) = handshape subscripts on handshape
SIG (< Signation) = movement compound notation used to re-
present signs with two present signs with two locations

I. BASIC FORMS

Each sign must have one TAB, one DES, and one SIG in that order TD³

[JA^x ∪A^x ØW^o

Some signs have two handshapes TDD³

ØBB[>] ØL^oL^o GL^ox

Some signs have two simultaneous movements TD³ or TDD³

[JB^x DI^o ~B^x

Some signs have two sequential movements TD³ or TDD³

✓V^{x>} CI^{v>} ~V^{x>} or ~V^{xv>}

Some signs have both sequential and simultaneous movements TD³ (etc.)

[JK^{x>} ∪B^{x>} C55^x∪

Repeated movement is shown by a dot following the sig symbol TD³

DI^{x.} 3A^{x.} ØYY^{w.}

Alternating movement is shown by a tilde (~) following the sig symbol

~III^o ØG^oG^o~ [JÁÁ^x~

II. ORIENTATION

Orientation of the hands to the signing space is shown by a subscript on the DES symbol. Orientation symbols look like SIG symbols, but they mean starting position, not movement. TD³

ØB_nB_n[~] Ø3_v3_v[~] ~O_r^x

~Y₁^x DV_v^{ox} Øx₁x₁^x

III. RELATIONSHIPS BETWEEN THE TWO HANDS

In signs involving both hands, symbols are sometimes used to show the positions of the hands as related to each other.

X_xX_x['] √X^x A₁A^x ØH^xH^x

Some signs use the non-dominant hand as the TAB. In these cases the first DES symbol represents the non-dominant hand, and the second indicates the dominant.

5^oG^a I₁I₁['] I^xX₁^o

Some signs show the change in handshape as part of the movement notation, and also indicate the final shape in raised brackets.

~5_v∪ [O] [J5₁]^o

IV. COMPOUND SIGNS

Signs which require contact at two locations are often notated in compound form. Many of these signs are historically decomposable into two separate meaning components.

Compound symbol ||

Examples ~5_v∪ || [J5^x ~6^x || [J5^x
[J5₁∪ || Ø5_v5_v∪

V. Miscellaneous leftovers

A few signs require simultaneous contact in two different locations. The two necessary notations are shown in vertical arrangement and are joined together by square brackets.

[ØA_v^o]

Diacritical marks are additions to the symbol set that modify in small ways the symbols that are seen as basic.

A B ñ ð among others can show thumb extension
∪A₁^x
ñ ð v ö among others can show curved or 'bent' fingers

A dot (·) above a movement symbol means sharp, strong single movement
TD³ TD³ · to the right of a movement symbol means repetition

∪ 'square Y' seems to be a shape needed in ASL
G_Y^x

∪ shows one hand in front of the other; however it can be interpreted in two ways. TD₁D³

∪ When this TAB appears before signs with two DES symbols, remember that the movement applies to both hands.

ØGG^x

If no ∪ is present and the sign has two DES symbols, then the first is the base hand and the second is the active hand. Only the active hand moves.

GG^x

3. Level of Representation

The following discussion will only summarize in the briefest way a few of the relevant points which have been widely and carefully discussed in cognitive studies.

In assigning a written representation to a speech act, there are always choices available. Certain written forms will capture one part of the spoken signal. In most ordinary orthographies today, there is the expectation that each symbol will represent a single sound and that is the alphabetic principle. Modern English, however, violates this expectation in numerous ways; it has silent letters (some of which trigger pronunciation changes in preceding segments [can, cane]), many letters or sequences of letters have more than one possible pronunciation (c-> s or k, a-> ...), there are homographs and homonyms (words that are spelled alike but pronounced differently, e.g., lead, lead; and words that are pronounced alike but spelled differently, e.g., lead, led), and so on.

The question of what sort of orthography should be chosen when starting off anew, as for example in the case of sign languages which have no history of written representation, will probably in part have reference to the question of the function of the writing system. (See Section 4.)

3.1 Phonetic Representation

Phoneticians who are interested in the details of the physical signal will have a choice between a broad or a narrow transcription system. That is, the notation system may capture the general phonetic qualities of a particular speaker's performance but overlook the nuances. Those nuances for a new spoken language might include aspiration, voicing, and release of consonants, tonal patterns, primary, secondary and further gradations of stress. For each language, as one becomes more familiar with the inventory of articulatory units, it may be less necessary to use a narrow transcription system. However, the study of the interaction of social factors with language performance will quite likely demand attention to such "minor" details.

3.2 Phonemic Representation

The phonemic representation only lets orthographic distinctions exist where they are not predictable by phonological rule. In some cases this level of representation can incorporate some morphological information as well, depending on the interplay between sound structure and morpheme structure in the language. In English, for example, the vowel shift rule is presumed to be known to the reader. Thus, pairs like divine/divinity, serene/serenity, and insane/insanity are spelled with the same medial vowel in each pair, despite the change in pronunciation. The alternative values of the vowel-graphs are created in the "mind's eye" of the fluent reader.

Marianne Mithune has suggested in the consideration of teaching writing systems to speakers of Native American languages that the ideal level of phonemic "simplicity" for the linguist may be beyond the level

recognized by the fluent but previously illiterate speaker of the language. Adults who knew Mohawk fluently, participating in a program to learn to be teachers of the language, were unable consistently to "hear" one of the regular phonological rules that the analyst knew to be in the repertoire of Mohawk phonological performance. An "automatic" rule of Mohawk phonology changes sequences of primary stressed vowels followed by [h] or [ʔ] to secondary stressed long vowels. The rule might be written

$$V \rightarrow V: / ____ \overset{h}{?}$$

Ex. the stem -kahr- "eye" becomes oka:ra^ʔ "an eye"
 kkahra:ke "on my eye"

But this more morphophonemic level was not what native speakers of Mohawk were able to read or write. Even with an explanation of the rule, which they all performed unconsciously, they preferred to see the more surface-like spellings which obscure the morphological relationships.

3.3 Additional Levels

English orthography, such as you are reading now, includes a great deal of information about the language, beyond pronunciation of individual segments or combinations of segments. The conventions of capitalization, punctuation, spacing between symbols, and so on, all signal information to the reader about syntactic relations, meaning, and word and sentence boundaries. Some problems remain however, because this sort of orthography does not preserve information about accent, rhythm and intonation. Sequences of words when written down may have several alternative (even potentially contradictory) interpretations if pronounced with different rhythmic and intonational characteristics. Bolinger (1968) points out numerous examples where the lack of cues for these dimensions of the spoken language will lead to ambiguity of written forms:

John left a message for Henry, and then he called Anne.

In the preceding example, the reader doesn't know whether John or Henry called Anne. Presumably, the surrounding context will help to disambiguate these problems. In spoken form, of course, the strength or weakness of the stress on he will indicate which antecedent is intended.

3.4 Optimal Orthography

E.S. Klima, among others, has discussed the characteristics for an optimal orthography. He recommends a balance of four factors which need to be considered in relation to the particular language. He defines an orthography as a general principle whereby units of the language are represented by written symbols so that the reader can reconstruct the linguistic units from their orthographic representation.

The four factors he cites (1972:61) as crucial to consider in devising or evaluating an orthography are:

- (1) Arbitrariness of the relationship between the orthographic units and linguistic units.

An orthography which is less arbitrary will be easier to learn.

- (2) Redundancy of orthographic representation vis-a-vis linguistic form.
An orthography which is economical is better than an overly redundant one. However, Klima specifically disregards the discriminability of letter forms within this factor.
- (3) Ambiguity in orthographic representation with respect to linguistic form.
An orthography must be suitably expressive.
- (4) Standardization of spelling.
A difference in spelling should represent a difference in linguistic structure; the same word should not have two spellings.

The interplay between the factors is seen in several examples worked out by Klima. For instance, the increase in expressiveness gained by creating distinct spellings for words with the same sound-form (homonyms) as English does at times (e.g., pair, pare, pear) is also an increase in arbitrariness for the learner.

4. Function of a Writing System for Sign Language

The questions of who will use the writing system for sign language and for what purposes they will use it are intimately tied together with the set of possible solutions to the difficulties in selecting an optimal orthography for a particular sign language or the class of sign languages in general. At least four distinct contexts for the use of written forms for signing come to mind.

4.1 Research Tool

The investigation of sign languages has been able to proceed more rapidly in the most recent period in part because investigators have been developing and sharing systematic ways of noting the particular characteristics of the signing signal that they wish to draw attention to. The use of standardized glosses with accompanying diacritical marks, for example, is one method that allows different investigators with different materials on hand to make comparisons between each others' findings. The concomitant use of a symbolic representation for the sign-form of "words" in sign language permits phonological analysis and comparison. The orthography devised for the maximum benefit of the research community will have maximum universality and maximum expressiveness. The IPA (see 5.1 below) for sign languages will need to encode all and only the relevant handshapes, locations, movements and non-manual articulations that occur in the world's sign languages. The representation system will necessarily include some information about initial and final location of the hands from sign to sign since investigators of American Indian signing as well as deaf signing have noticed the information load carried by such spatial and directional cues.

4.2 Literature, Documentation

In order to preserve the history and art of a signing community, as well as the scientific and technical discoveries made by its members,

a means of representing these kinds of information likewise is necessary. Klima's four factors do not allow for accommodating dialect variations: for some kinds of (verbal) art such variation may need to be preserved. Certainly, the least "symbolic" solution -- videotape or film -- would succeed in maintaining the dialect as well as individual flavor of each presentation. Some adaptation to an orthography, however, might solve the problem more parsimoniously.

4.3 Mundane Uses

Writing is used in ordinary interchanges to leave notices for friends or strangers, in letters, in reminders to oneself, and for deaf persons in non-face-to-face exchanges (e.g., on the telephone). For an orthography to be useful here, it should be easy to learn and standardized. External factors such as being easy to type on an ordinary typewriter for English may take on significant importance in choosing from among possible symbolic systems.

4.4 School Materials

As sign language research continues to demonstrate the complexity of expression capable within this class of languages, the openness of the educational establishment to include more "deaf-like" varieties of signing in the school curriculum grows. Thus, we anticipate the increasing need for graded materials within all subject areas to be used in programs for deaf youngsters. Similarly, sign language may have positive value in the rehabilitation and education of some language disabled individuals. Once again, high redundancy and low arbitrariness will be important factors to consider as these materials are developed.

4.5 Reading and Writing

In part, at least, the ability to read a written form and the ability to reproduce that form accurately can be separated for the purpose of argument. Symbolic notation systems such as Labanotation, Stokoe's notation, or Sutton's Sign Writing may perhaps be read more easily than they can be written. Sutton, for one, has specifically designed a shorthand version of her notation system in order for the practiced notator to be able to take dictation, write a letter, and in other ways use her system for ordinary purposes. The fact that these symbolic notation systems look so different from ordinary English writing is seen by the signing community as a negative factor. Despite the fact that each of these systems was designed for notating physical movement of non-vocal articulators (and therefore each might be developed into a truly optimal orthography for signed languages), the social pressures on a minority community to use the prestige (majority) orthography cannot be ignored.

It is also true that Sutton's system has been adapted for use as a dictionary device. Insofar as her Sign Writing attempts to capture the movement from one sign to the next, or complex movement within a sign (as would be necessary for a research tool beyond the lexical level, or for a documenting device) the results are uncertain. The system may have the potential to show the co-reference between signs, and subsequent change of topic or referent, but the examples available in the Sign Writer newspaper (or the technical vocabularies available from the National Technical Institute for the Deaf) do not show it.

I do not know enough about the other dance notations to be able to offer any deeper criticism. The question remains for me whether they are in effect too powerful as they stand to be useful in the recording of sign languages. At the same time, they are intended to record a quite different type of signal. The issues of ambiguity (in Klima's sense), and economy (or redundancy) in particular, refer to choices in an orthography based on representation of form or meaning. Can any of the dance notations be adapted to limit the choices only to those which would be linguistically significant?

5. Comparisons with Representation Systems for Spoken Languages

As has been stated several times above, the orthography for a particular language will need to be considered in relation to the structure of the particular language. In this section we can look at several writing systems in relation to the linguistic system(s) they are intended to capture.

5.1 The International Phonetic Alphabet

The International Phonetic Alphabet has been devised in accordance with an overtly stated set of principles. It is intended to be used for representing the sound-form of any (spoken) human language. In this way it is built on the principle that all human languages draw from a (possibly large) limited number of language sounds.

The principles which the IPA holds to are:

- (a) If two sounds occurring in a given language are phonemic (that is, they are used for distinguishing words), they are represented by two distinct letters, not by diacritical marks. The use of usual Roman letters is encouraged wherever possible.
- (b) Two sounds which are nearly acoustically indistinct can be represented by the same letter. (In narrow transcription separate letters or diacritics can be used.)
- (c) The graphic form of non-Roman letters of the IPA should "harmonize" with the Roman.
- (d) Diacritical marks are recommended to indicate
 - i. length, stress, intonation
 - ii. members of phonemes
 - iii. variation from known phonemes (to avoid designing new symbols)
 - iv. scientifically important shadings of sound.

As the reader will appreciate, these principles are both concerned with linguistic issues and with issues of aesthetics in representation.

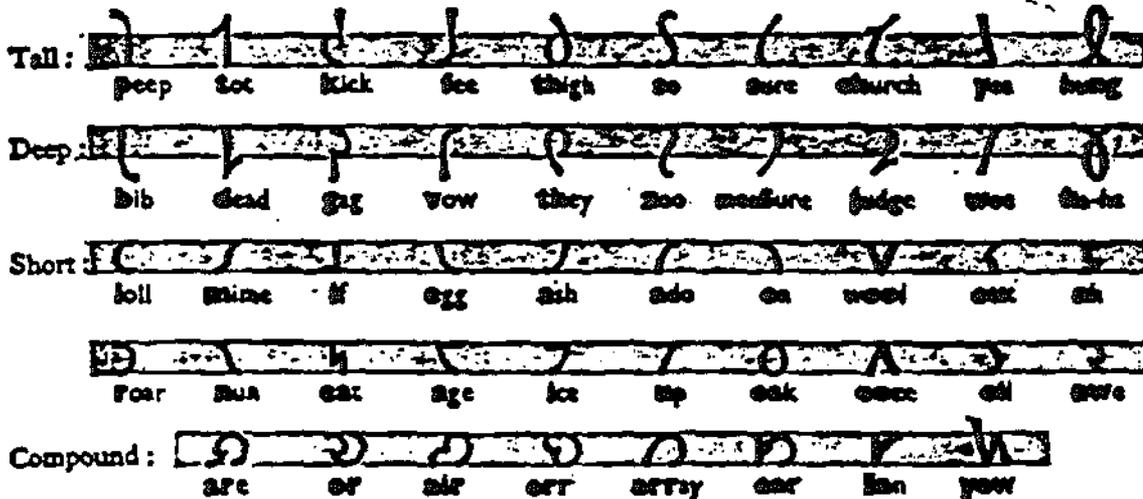
5.2 Phonetic Writing Proposals for English

Briefly, we can look at two of the phonetic writing proposals which have been made for English. Many scholars, as well as lay persons, have been troubled by the complexities of English spelling for a long time.

Among these people was George Bernard Shaw. Shaw's system is certainly parsimonious in graphic form. The difficulty for this as with other phonetic proposals for English is that (a) it cannot represent diverse dialects using the same symbols (thus American English words would not be spelled the same way as British English), (b) it obscures the many phonological and morphological relationships which current English spelling shows to be related, (c) all homonyms would be spelled alike (where now, at least some are distinguished orthographically).

The Shaw Alphabet Reading Key

The letters are classified as Tall, Deep, Short, and Compound.
Beneath each letter is its full name: its sound is shown in bold type.



The four most frequent words are represented by single letters: the *q*, of *f*, and *v*, to *l*.
Proper names may be distinguished by a preceding 'Name' dot: e.g. *·y&S*, Rome.
Punctuation and numerals are unchanged. Learn the alphabet in pairs, as listed for Writers overleaf.

The Shaw Alphabet Edition of Androcles and the Lion, Penguin, 1962,
G.B. Shaw

The next sample shows a page from Alexander Melville Bell's book, Visible Speech, in which he proposed an orthography for instruction of non-English speakers, if not true spelling reform. The shapes of the symbols have some relationship to the position of the tongue and the shape of the mouth during articulation. Similar objections to those above for Shaw might be leveled at Bell's proposal.

5.3 Syllabic Writing

Syllabic writing uses a single symbol to represent the sound of the sequence of consonant and vowel. Two different examples of syllabic writing are Japanese and Cherokee.

5.3.1 Japanese

Japanese is a language which obeys a rather strict principle of sound structure in which words are constructed of consonant-vowel sequences. No consonant clusters are permitted, nor do words end in consonants (other than n). Therefore, it is possible for the Japanese to use a syllabary rather than an alphabet, with equal economy. In this system each symbol stands for a sequence of consonant and vowel. It only requires some 47 symbols (plus a few diacritical marks) to represent all of the sounds of Japanese. The figure below shows the katakana of Japanese.

ア	カ	サ	タ	ナ	ハ	マ	ヤ	ラ	ワ	ガ	ザ	ダ	バ	パ
a	ka	sa	ta	na	ha	ma	ya	ra	wa	ga	za	da	ba	pa
イ	キ	シ	チ	ニ	ヒ	ミ		リ	ヰ	ギ	ジ	ヂ	ビ	ピ
i	ki	si	ti(tsi)	ni	hi	mi		ri	wi(i)	gi	ji	ji	bi	pi
ウ	ク	ス	ツ	ヌ	フ	ム	ユ	ル		グ	ズ	ヅ	ブ	プ
u	ku	su	tsu(tsu)	nu	fu	mu	yu	ru		gu	zu	zu	bu	pu
エ	ケ	セ	テ	子	ヘ	メ	エ	ヱ	ヰ	ゲ	ゼ	デ	ベ	ペ
e	ke	se	te	ko	he	me	ye	we(e)	wi(i)	ge	ze	de	be	pe
オ	コ	ツ	ト	ノ	ホ	モ	ヨ	ロ	ヲ	ゴ	ゾ	ド	ボ	ポ
o	ko	tsu	to	no	ho	mo	yo	ro	wa	go	zo	do	bo	po
ン	(n)													

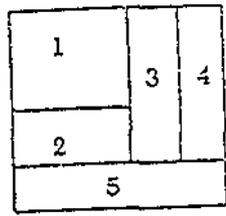
FROM Fossey, *Notices sur les Caractères Etrangers*, p. 314; reproduced in I. J. Gelb, *A Study of Writing*, rev. ed. (Chicago: University of Chicago Press, 1963).

Along with this system, the Japanese employ two more systems of writing. A distinct syllabary called hiragana is used to represent the sounds of native words, where katakana is reserved for foreign borrowings. Further, Chinese characters are incorporated into normal written Japanese for major content items, while the syllabaries serve to represent grammatical formatives, names and other items. For our purposes, though, the interesting element to focus on is that the sound structure of Japanese permits the use of a syllabic orthography rather than an alphabetic one.

5.3.2 Cherokee

Similarly, the American Indian language Cherokee uses the syllabary shown below. This orthography is partly based on adaptation of Roman letters, although as the reader can judge, the letter forms have not been assigned values in a way which takes advantage of the redundancy possible in the system. That is, forms which look similar have not been assigned values which are related in sound-form.

HANKUL (Korean) invented by Sejong (15 Century)



Consonants (Positions 1 & 5)

k	n	t	l	m	p	s	ŋ	č	ch	kh	th	ph	h
ㄱ	ㄴ	ㄷ	ㄹ	ㅁ	ㅂ	ㅅ	ㅇ	ㅈ	ㅊ	ㅋ	ㅌ	ㅍ	ㅎ

Position 2: u Position 3: a e Position 4: i

o	yo	ya	ye	yu	wu	wu	wi	wa	
ㅜ	ㅠ	ㅑ	ㅓ	ㅠ	ㅜ	ㅠ	ㅑ	ㅓ	
uy	ay	ey	oy	yuy	yey	wey	way		
ㅡ	ㅕ	ㅖ	ㅗ	ㅛ	ㅜ	ㅠ	ㅑ	ㅓ	

Structure of Korean Graphemes

susun	스승	'teacher' 12, 125	kan	칸	'room' 135
kwa	과	'department' 123	il	일	'work' 145
seyjon	세종	'Sejong' 134, 125	kkway	꽤	'much' 1234
ka	가	'edge' 13	hwan	황	'yellow' 1235
i	이	'house' 14	kayn	강	'gang' 13-15
waynwayn	웅비웅비	'whistling sound' 123-15, 123-15			

D	·	R	·	T	·	ᄀ	·	ᄁ	·	ᄂ	·	
f	·	h	·	y	·	A	·	J	·	E	·	
ᄃ	·	ᄄ	·	ᄅ	·	ᄆ	·	ᄇ	·	ᄈ	·	ᄉ
W	·	ᄊ	·	P	·	G	·	M	·	ᄋ	·	
ᄌ	·	ᄍ	·	H	·	ᄎ	·	ᄏ	·		·	
ᄐ	·	ᄑ	·	ᄒ	·	Z	·	ᄓ	·	ᄔ	·	
I	·	ᄕ	·	ᄖ	·	ᄗ	·	ᄘ	·	ᄙ	·	
ᄚ	·	4	·	b	·	ᄜ	·	ᄝ	·	R	·	
ᄞ	·	f	·	ᄟ	·	ᄠ	·	S	·	ᄡ	·	
ᄢ	·	L	·	G	·	ᄤ	·	ᄥ	·	P	·	
ᄦ	·	v	·	ᄧ	·	K	·	ᄨ	·	ᄩ	·	
G	·	ᄪ	·	ᄫ	·	ᄬ	·	ᄭ	·	ᄮ	·	
ᄯ	·	ᄰ	·	ᄱ	·	ᄲ	·	ᄳ	·	B	·	

FROM H. A. Gleason, *An Introduction to Descriptive Linguistics*, rev. ed. (New York: Holt, Rinehart and Winston, Inc., 1961), p. 414.

The Cherokee system, invented by Sequoya between 1909 and 1921 has been adopted by the Cherokee people and those outsiders who work in the Cherokee community. Apparently, Sequoya understood the principle behind writing and felt it to be important enough to spend a good deal of his own time working on, despite the fact that he never actually became literate in English.

5.4 Korean

In some respects, Korean is the most interesting example for our comparison. Korean is not genetically related to Chinese although it has borrowed much vocabulary from the latter language. Korean grammar is quite distinct from Chinese grammar, and Korean literature has been influenced heavily by the well-known classical literature from China. In these several ways, the language of the smaller population feels the impact of the larger and politically stronger language, just as ASL borrows English vocabulary while remaining grammatically distinct, and ASL signers are expected to be familiar with literature in English as much as with any traditional signing material.

In the 15th century, the Korean ruler Sejong invented the Hankul system of writing. In principle the system is alphabetic, but in its display the forms look vaguely like Chinese. That is, the combination of types of strokes in the orthography and their visual relationships lend an overall impression of characters rather than a linear alphabet.

Korean, unlike Chinese, permits a variety of consonants in syllable-final position. It also has words of more than one syllable. The Hankul system considers each syllable an orthographic unit, but within that unit there is the C-V-C structure. The diagram below shows the positions for syllable initial consonant (1), medial vowels (2,3,4) and syllable final consonant (5). The examples of the letter values and written whole words (together with the analysis of graph positions) is borrowed from B. Pearson (1977: 286-287).

Of instructive value as we attempt to consider possible writing systems for sign languages is that the Korean system, while departing from the domination of Chinese characters for its representation, still maintained some connection to the prestige language in its area by keeping the symbolic form similar in appearance to the Chinese. The Hankul syllables could be written in vertical columns as Chinese traditionally was, thereby not making it immediately noticeable what sort of text one was writing or reading.

6. Summary

At the present time, no universally accepted system of notation or writing exists for sign language (of the deaf). This paper considered several possible types of representation, including among the more symbolic, several forms of dance notation, a symbol set designed for American Sign Language, and a Roman orthography for signing.

The level of representation which is chosen in a writing system can be considered to relate to both the functions for which the system is put to use and the balance between idealized factors such as arbitrariness, redundancy, expressiveness, and standardization.

Comparisons with several systems of notation and orthography for spoken language reveal the interplay between aesthetics and parsimony, linguistic structure, tradition, and social factors in the choice of an orthography.

The problems involved in the selection of an appropriate writing system for sign languages of the deaf involve all of the mentioned aspects. Our present understanding of the range of variation in the inventory of basic building blocks of possible sign languages of the world is meagre. Our present analyses of morphological and syntactic structures of signing suggest that much of this information will be needed in the written representation in order to prevent the sort of "broken English" misunderstandings of signing from being perpetuated in English-gloss treatments. The question of whether an unfamiliar, possibly pictorial representation system such as one of the dance notations (or a modified Stokoe notation) could overcome the psychological barrier posed by its "differentness" from an alphabetic system is difficult to evaluate. Our multiple uses for a writing system, as a research tool, a means of ordinary discourse, a method of preserving literature or other documentation, and as a pedagogical aid, may preclude a single system from being adopted universally.

It is possible that the several systems being promoted now will continue to compete for the signing audience. Among the promising signs is that several of these are being adapted to suit particular projects and purposes. For a living language tradition, it may prove useful to have an organic, evolving solution to the problem of writing.

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