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Patterns in the mind
Language and human nature

For Amy and Beth

RAY JACKENDOFF

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environment. Given a knowledge of words, a child can determine word order. But tree structures, and the categories present in them (NP, VP, etc.), can't be observed. They have to come from inside the mind, as it were "instinctively" or "intuitively." Universal Grammar is, if you like, the organization of that instinct.

7 American Sign Language

Basic facts about American Sign Language

I am concluding this part of the book with a brief discussion of American Sign Language (ASL), the language of the Deaf community in the United States and most of Canada. I have chosen to do so in part because of the intrinsic interest of signed languages, but more specifically because of the light they shed on language in general. In addition, research on ASL plays a prominent role in our discussion of the biological basis of language in Part III, so it makes sense for me to acquaint you first with some facts about the language.

The most important thing I want to stress is that *ASL is a language*. Of course, it seems completely different from familiar languages such as English, Russian, and Japanese. Its means of transmission is not through the speaker's vocal tract creating acoustic signals that are detected by the addressee's ears. Rather, the speaker's gestures create signals detected by the addressee's visual system.

Some people have found such communication altogether alien and magical. I'll try to show, though, that the differences are rather superficial. It is sort of like switching a VCR-TV system from videotape to videodisc—the peripheral system is different, but the inner workings are exactly the same.

Not exactly the same as *English*, though. ASL is emphatically not just a coding of English into manual signs. Such codings do exist, but they can be clearly distinguished from ASL. One is *fingerspelling*, in which each letter of the alphabet has a hand sign, so that English words can be spelled out letter by letter on the hand. This is used to sign names and technical terms of English for which there is no conventional ASL translation—much as words like "glasnost" and "perestroika" were borrowed whole into English some years back.

The other coding of English into signs is called *Manual English* (or, in one variant, Signing Exact English). It renders literally into

signs the word order of English, even adding to its words suffixed signs for the English plural and past tense endings. Manual English was devised by educators as an aid in teaching English to deaf children. It is sometimes used in simultaneous translation of English into sign. However, as we will see, a word-for-word translation of English, complete with prefixes and suffixes, is quite different from ASL, which has its own grammatical organization. Native ASL speakers find Manual English awkward and unnatural, and its use is disfavored by the Deaf community.*

ASL itself exhibits the full expressive variety of spoken languages. It is not just pantomime, of the sort that speakers of, say, English and Mohawk might make up on the spot in order to communicate with each other. It has a standardized vocabulary and as fully complex a grammar (i.e. mental grammar) as spoken languages. It is a suitable vehicle for jokes, arguments, poetry, drama, and science (including linguistics).

Like vocal-auditory languages, there are many different sign languages spoken throughout the world. Japanese Sign Language and British Sign Language, for instance, are independent languages that cannot be understood by an ASL speaker. (When an ASL speaker and a Japanese or British Sign Language speaker want to communicate, then *they* have to resort to pantomime too!)

Interestingly, a sign language different from ASL was spoken on the island of Martha's Vineyard, off the coast of Massachusetts, for at least two centuries. Here there was a high incidence of inbred genetic deafness, which persisted into the early twentieth century owing to the island's isolation. But in Martha's Vineyard, unlike most of the rest of the world, the deaf were not at all socially stigmatized. Rather, it was taken for granted that the hearing were fluent in sign as well. With none of the usual linguistic barriers, the deaf were fully functioning and fully integrated members of the community.

Returning to ASL, its pedigree goes back at least to the mid eighteenth century in France. Charles Michel, the Abbé de l'Épée, undertook to educate the deaf, and discovered that the deaf of Paris

* To get a sense of what Manual English might feel like to an ASL speaker, imagine "Spoken Exact German," in which English words are used in German order and with German inflections for gender and case. In this language, "The man didn't give the book to the woman" would be rendered as something like "The-masculine-nominative man has the-feminine-dative woman the-neuter-accusative book not given," in parallel to the German "Der Mann hat der Frau das Buch nicht gegeben." It's uncomfortable indeed.

had an indigenous sign language that they used to communicate with each other. Using this as a basis of instruction, he developed methods for teaching the deaf to read and write French. His pupils astonished and excited the European intellectual community: l'Épée had shown that the deaf were neither mentally retarded nor incapable of reason, as had been widely assumed. L'Épée's school, founded in 1755, trained teachers who spread his methods of teaching—as well as the use of French Sign Language—to schools for the deaf throughout much of Europe.

In 1817 the first American school for the deaf was opened in Hartford, Connecticut. Its language of instruction was French Sign Language, introduced by Laurent Clerc, a deaf graduate of L'Épée's school. This school was quickly followed by other residential schools throughout the country, and 1864 saw the founding of the National Deaf Mute College, now Gallaudet University. In these schools, students speaking a variety of sign languages (including Martha's Vineyard Sign) were brought together, and elements of their languages blended with French Sign Language to form ASL. (Such blending doesn't take place by design; it is a natural outcome of intimate contact between languages. The English of Chaucer formed from a similar blending of Old English with Norman French in the centuries after the Norman Conquest.)

The status of sign—and of the Deaf community—was dealt a severe and long-lasting blow in 1880, when the International Congress on the Education of the Deaf voted overwhelmingly against the use of sign and in favor of oral instruction (after first denying the deaf among them the right to vote!). The philosophy behind the resolution was that only with the use of speech could the deaf be integrated into society. The actual outcome was the degradation of deaf education. (Imagine trying to learn anything from a television set with the sound turned off. Remember: lip-reading gives access only to what the lips and perhaps the tip of the tongue are doing, not to features of voicing, nasality, or movement of the body of the tongue. Consequently, the sounds *p*, *b*, and *m* look identical, as do *t*, *d*, and *n*, for instance. Not so easy, even to a fluent user of a spoken language.)

Despite the official suppression of ASL in schools for the deaf, the language was used in the dormitories and passed on to new generations of speakers. The schools in fact have played a focal role in the use of ASL: most deaf students come from families with hearing parents, so that their first exposure to the Deaf community

and to sign (and thus to any comprehensible language at all) occurs when they go to school.*

The current rebirth of respect for ASL is generally acknowledged to have begun in 1960, with the publication of William Stokoe's *Sign Language Structure: An Outline of the Visual Communication System of the American Deaf*. Stokoe showed that ASL gestures have systematic organization that strongly parallels the phonological structure of spoken languages. By the 1970s his work had been taken up by a substantial number of linguists, both deaf and hearing, and there is now a vibrant community of researchers examining ASL and other sign languages.

Among other things, this research has served as public legitimation of ASL as a real language. It has helped to empower the Deaf community to take pride in their language and culture, and to demand the respect and political rights accorded other minorities. Yet, despite progress, there is much still to be done to improve the general perception of the Deaf and their language. Oral teaching is still the method of choice in most schools for the deaf. And awareness on the part of the general public leaves much to be desired. Not too many years ago, a colleague of mine, an otherwise well-informed and politically enlightened man, wondered whether my deaf graduate student was really answering the questions addressed to him in a colloquium—whether his interpreter might not actually be doing the thinking. Upsetting, to say the least.

Elements of ASL grammatical organization

Stokoe's discovery, which inaugurated the modern study of ASL linguistics, was that signs can be factored into a combination of parts: handshape, hand orientation, location of the hands in space, and movement of the hands. Like the distinctive features of phonological structure, these factors are themselves meaningless.

* This has recently come to serve as an argument against "mainstreaming" deaf children in public schools in the USA. The reasoning is that the residential schools provide a linguistic and cultural community with which deaf children can identify, and in which they can interact freely with their peers. In an ordinary public school classroom, with at best the part-time help of an interpreter, linguistic support and social interaction for the deaf child are meager. Not only does this produce a sense of isolation and severely hinder the educational process, it destroys one of the main mechanisms for transmission of Deaf culture.

To give an idea of how they work, here are some samples of signs that differ in only one of the factors. Figure 7.1 shows the signs for "candy," "apple," and "jealous." They have identical location, movement, and orientation, differing only in handshape.

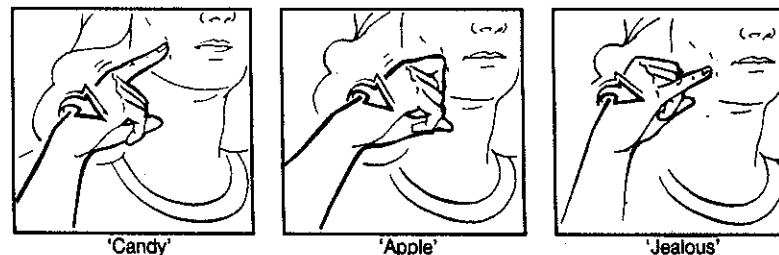


Figure 7.1 Signs that differ only in handshape (Illustration, copyright © Ursula Bellugi, The Salk Institute for Biological Studies, La Jolla, CA 92037, USA)

Figure 7.2 shows the signs for "Chinese" and "onion," which have handshapes and twisting motion identical to "candy" and "apple" respectively, but in a different location.

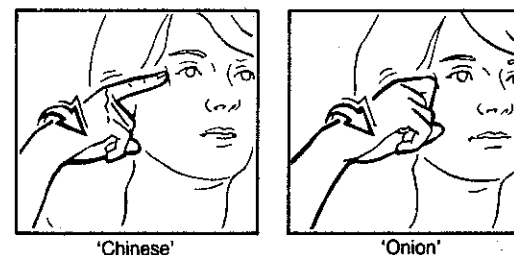


Figure 7.2 Signs that differ only in location from those in Figure 7.1 (Illustration, copyright © Ursula Bellugi, The Salk Institute for Biological Studies, La Jolla, CA 92037, USA)

Figure 7.3 shows the signs for “name,” “short,” and “egg.” They are all made with the same handshape, location, and orientation. The first two are made with different motions of the right hand; the last is made with motion of both hands.

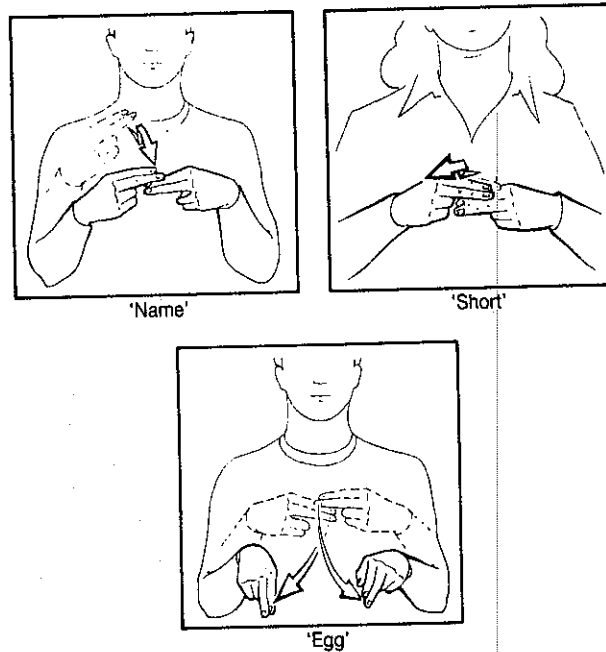


Figure 7.3 Signs that differ only in hand motion (Illustration, copyright © Ursula Bellugi, The Salk Institute for Biological Studies, La Jolla, CA 92037, USA)

Incidentally, these illustrations give a sense of the degree to which signs of ASL are *iconic*—that is, how much they depict the things they refer to. Sometimes, if we are told what a sign means, we can see why it might have been chosen: the distinctive eyes in “Chinese,” the rubbing of the eyes in “onion,” the breaking of the egg. But it would probably be difficult to *guess* what the signs mean if we didn’t know. Furthermore, why those twists of the hand in “Chinese” and “onion”? And do the signs for “name” and “short” make any sense at all?

These examples show that although *sometimes* signs *partly* depict what they refer to, hardly ever are the forms of signs completely determined by what they mean. So ASL vocabulary has to be learned just like that of a spoken language—though it sometimes has a little more mnemonic power than the arbitrary sounds of spoken language.

Stokoe’s analysis of signs shows that there are distinctive features of manual articulation analogous to the distinctive features of vocal articulation. More recent research has found a rhythmic structure in sign similar to that in spoken language. The basic rhythmic unit of spoken language is the syllable—roughly, a vowel plus whatever consonants (if any) surround it. The corresponding rhythmic unit in sign is a motion plus whatever held positions (if any) precede and follow it. Just as speakers of spoken languages tend to slow down at the end of a sentence, so do speakers of sign. Just as speakers of spoken languages tend to pronounce an emphasized word more loudly, speakers of sign tend to make an emphasized sign larger. We see, then, that ASL preserves significant aspects of phonological structure, while adapting the parts having to do with motor articulation so as to make use of the rather different possibilities inherent in the manual-to-visual channel of communication.

Turning to syntactic structure, ASL, like spoken languages, classifies signs into parts of speech, and it strings parts of speech together with modifiers to form larger constituents and clauses. It also displays long-distance dependencies such as *wh*-questions. As it happens, though, ASL forms *wh*-questions by putting the *wh*-word at the end of the sentence instead of the beginning—for instance, “Bill buy yesterday what?” instead of “What did Bill buy yesterday?”

I’d like to run through a few examples of phenomena in ASL syntax that look very different from English. I’ll try to show that in almost all respects they have analogues in other spoken languages, and are therefore recognizable as variants available in the menu of Universal Grammar.

The signs for “I” and “you” are pointing gestures directed at the speaker and addressee respectively. So far, apparently iconic. But further probing reveals more structure in the pronouns. First, changing the handshape from a pointing index finger to a flat palm makes the pronouns into the possessives “my” and “your,” and making the movement arc-like makes the pronouns into the plurals “we” and “you-all.” So the apparently iconic gestures actually form

part of a grammatical system. (English, of course, doesn't have separate forms for singular and plural "you"; but many languages of the world do, for instance Hebrew.)

Now let's look at the third-person pronouns. A grammatical strategy found in ASL is to sign the name or description of each character at a different location in the "signing space" in front of the speaker. Then, when the speaker wishes to refer back to a character previously named (the function of a third-person pronoun like "he" or "she"), it is necessary only to point at that character's designated location in signing space. Like the first- and second-person pronouns, this reference can be made possessive or plural by changing the handshape or motion respectively. The effect is that there are as many different third-person pronouns available as there are discernible locations in signing space.

This is actually a grammatical device not found in spoken languages. In "John told Bill that Susan likes him," who does Susan allegedly like? We can't tell. But in ASL, the pointing gesture corresponding to "him" would pick out the answer unambiguously.

One of the most intensively studied phenomena in ASL has been the forms of the verb. English verbs have only a few different forms: infinitive ("write" or "to write"), present and past tenses ("writes" and "wrote"), present and past participles ("writing" and "written"). ASL verbs, in contrast, can have a vast number of different forms, which incorporate information that would be expressed in English by separate words or phrases. For instance:

1. The direction of motion in the verb's sign can be altered, so that it begins at the location in signing space for the subject and ends at that for the object. If the subject and object are pronouns, they can be omitted altogether as separate signs. Figure 7.4 shows the signs for "ask," "I ask you," "I ask him," and "you ask me."
2. The motion of the verb can be inflected to show whether the action takes place at a point in time, over a long period of time, incessantly, repeatedly, or habitually. Figure 7.5 illustrates some of these variants ("stacked" arrows indicate repeated motion).
3. The motion of the verb can express how the action is distributed among a group of individuals over time. Figure 7.6 shows a few possibilities.



Figure 7.4 *Modification of a verb's motion to incorporate subject and object pronouns* (Illustration, copyright © Ursula Bellugi, The Salk Institute for Biological Studies, La Jolla, CA 92037, USA)

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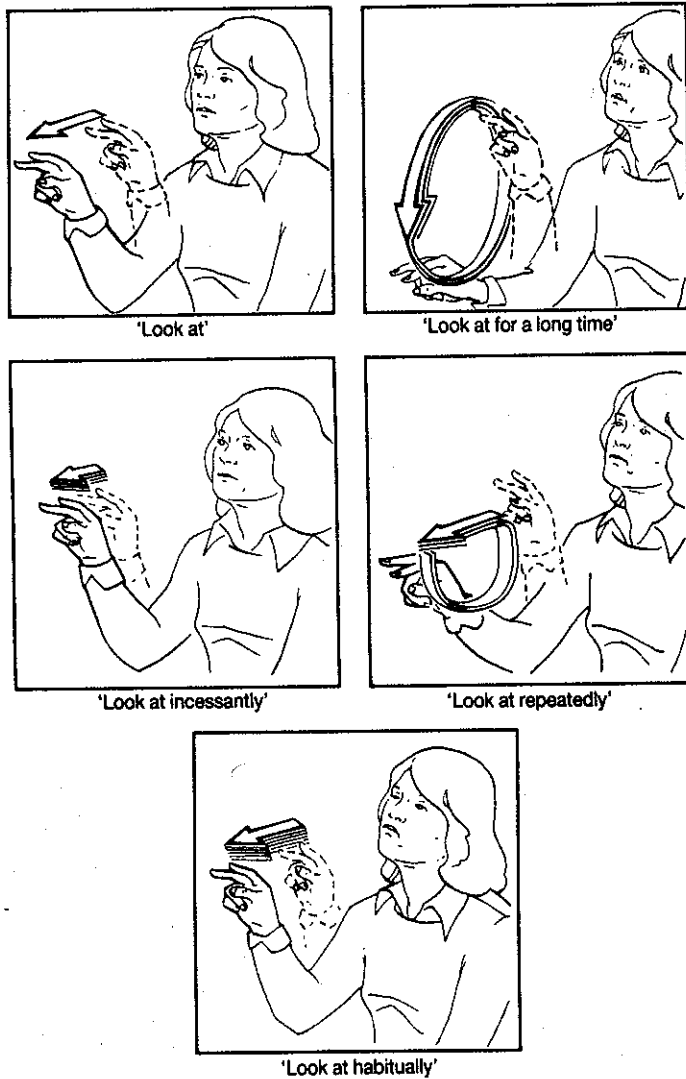


Figure 7.5 *Modification of a verb's motion to express duration and repetition of action (Illustration, copyright © Ursula Bellugi, The Salk Institute for Biological Studies, La Jolla, CA 92037, USA)*

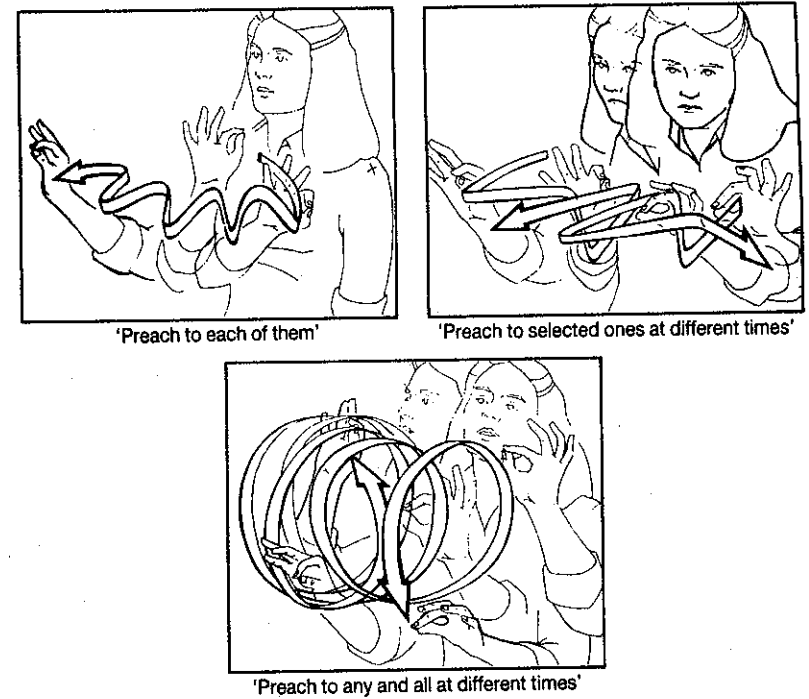


Figure 7.6 *Modification of a verb's motion to express distribution of action among a group of individuals over time (Illustration, copyright © Ursula Bellugi, The Salk Institute for Biological Studies, La Jolla, CA 92037, USA)*

This strategy of incorporating all sorts of modifying information into the verb looks altogether exotic from the point of view of English and most other European languages. But it is by all means an option in the menu of Universal Grammar: there are many so-called *agglutinative* languages with similar possibilities. Here are some examples from such languages, with analyses and translations.*

Hungarian:

beadogattathattuk
 be-ad - o - gat - tat-hat- t - uk
 in-give-them-distributive-cause-can-past-we
 "we could make someone hand them in piece by piece"

Onandaga:

tashako?ahsv:?
 t - a - shako - ?ahs - v: - ?
 cause-past-he to her-basket-give-past
 "he handed a basket to her"

K^wak^w'ala:

ai k'əlxlk' axsu?əmxat' ida q'isina
 a -i k'əlxlik'ax - su? - əm - xat-ida q'isina
 auxiliary-they eat raw-passive-really-also-the currant
 "raw currants are also eaten"

In each of these examples, a single word incorporates the verb of the sentence plus the subject and/or object, plus various other markers that would be expressed in English by extra verbs, auxiliary verbs, or adverbs. Such combinations are comparable to those of ASL in both complexity and content.

In these languages, all the extra information appears as prefixes and suffixes on the verb. In ASL, though, it is *inside* the verb, changing the motion of the hands. But in fact there are spoken languages that use a parallel to this strategy too. The most notable examples are Semitic languages such as Arabic and Hebrew, in which different forms of the verb preserve the order of the consonants but change the vowels and the length of the consonants. Here is a small

sample of the vast number of forms for the Arabic verb "to write," whose basic consonants are *k-t-b*.

- (1) *a* kataba "he wrote"
b kaataba "he corresponded"
c kutib "was written"
d kattaba "he caused to write"

So even the way verbal modification is accomplished in ASL parallels a possibility in the phonology of spoken languages.

The last wrinkle in ASL which I want to mention is that it is not all done with the hands. Facial expression also plays a crucial role in syntactic structure. For instance, the following three sentences of English are translated into ASL with the very same sequence of hand signs:

- (2) *a* The woman left her book.
b Did the woman leave her book?
c The woman didn't leave her book.

The difference is signaled by the face. The simple statement (2a) is accompanied by a neutral expression. The question (2b) is signaled by a brow raise, widened eyes, and frequently a tilting forward of the head or whole body. The negative sentence (2c) is signaled by a side-to-side headshake and frequently by drawing the brows together. These gestures make different use of the facial muscles from ordinary facial expressions, which is why ASL speakers may seem to be grimacing as they speak.

Like the features of the pronoun system, ASL facial gestures function combinatorially. For instance, to ask a negative question ("Didn't the woman leave her book?"), a speaker uses both gestures at once: drawing the brows together and raising them, widening the eyes, and tilting the head forward while shaking it from side to side.

Lest it should seem strange that questions and negations can be formed without changing word order, let me remind you that English can signal questions by intonation alone: "The woman left her book?" Here, just as in ASL, the questioning is carried on a separate channel from the words, conveyed simultaneously. Simple negation can't be expressed in English by intonation, but sarcastic disbelief can: "Oh, yeah, sure—you really won the lottery (. . . and I'm the Queen of England)." So even these devices of ASL have spoken analogues (though probably without the rich combinatorial possibilities).

* The Hungarian example is courtesy of Piroska Csuri. The example from Onandaga, a language spoken in the vicinity of the Great Lakes, appears in Mark Baker, *Incorporation*, University of Chicago Press, 1988, p. 76, citing H. Woodbury, *Noun Incorporation in Onandaga*, a Yale Ph.D. dissertation of 1975. The example from K^wak^w'ala, a language of British Columbia, is cited in Stephen Anderson, *A-Morphous Morphology*, Cambridge University Press, 1992, p. 92.

The Fundamental Arguments again

Even with this tiny amount of information about the language, it's not hard to restate the Fundamental Arguments in terms of ASL. The Argument for Mental Grammar: What do ASL speakers know that enables them to speak and understand an indefinitely large number of sentences? They can't just be memorizing signs, since even a single verb can occur in an unbelievable number of variants (of which we have seen only a few here). Rather, speakers must have in their heads a mental grammar—a basic vocabulary of signs, plus a set of patterns for combining signs sequentially and simultaneously. The difference in modality serves to make the complexity of the patterns all the more vivid: once we see that ASL goes beyond pantomime, the skill displayed by its speakers is harder to take for granted than mastery of a spoken language, if only because the complexity can literally be seen.

The Argument for Innate Knowledge: How, then, do ASL speakers acquire these patterns? The facts of ASL learning militate against its being taught. Recall (1) that most ASL speakers have hearing parents who, prior to their child's education, were not even aware of the existence of the language; (2) that ASL has been primarily spread through the residential schools for the deaf; and (3) that until very recently the use of ASL in these schools has been officially discouraged and even punished. Consequently, people have had to learn the language not by instruction, but by "picking it up" from fellow students. This is essentially parallel to the situation of immigrant children, except it involves learning a *first* rather than a second language: typically, there is no language a deaf child can use with hearing parents.*

Yet, as with spoken language, linguists are working overtime to discover the organization of ASL patterns, to find the units out of which ASL is built. The fact that it took until 1960 to begin to see these units is in itself striking. (Of course, for a long period, analysis was hampered by the prevailing ideology that ASL *had* no patterns. But the fact that such an ideology was believable also helps make my point.) So we are faced with the Paradox of Language Acquisition

* There is undoubtedly *communication* between deaf children and their parents through pantomime, body language, and the like. But, as stressed in Chapter 2, such communication does not constitute a *language*, in that it lacks the expressive variety and grammatical structure of spoken languages—and of ASL. See Chapter 10 for a discussion of how elaborate such communication can be.

again: children acquire an unconscious mental grammar of ASL, but linguists can't yet figure it out.

We conclude, as before, that children come equipped with unconscious hypotheses about what the mental grammar should be like. These hypotheses can't be specific to ASL, for deaf children learn whatever sign language they happen to come in contact with. So there has to be some sort of Universal Grammar for sign languages, just as for spoken languages.

But wait: remember that Universal Grammar itself isn't learned—it has to be transmitted genetically, and the genetic information has to be a product of evolution. It would seem bizarre for evolution to have provided us with a Universal Grammar for sign languages, to be drawn on just in case we happen to be deaf! Fortunately, as we have seen, there is a better answer: in almost all respects, the UG for sign languages is exactly the same as UG for spoken languages. Deaf children exposed to ASL don't have to draw on an entirely different body of innate knowledge. They expect the same organization in sign that they would have expected in spoken language, could they hear it. The very same special-purpose machinery kicks in. Children come prepared to learn *language*, in whatever modality.

The main adaptation of sign languages is replacing the distinctive features of vocal articulation by distinctive features of manual and facial articulation. An interesting by-product of this adaptation is a much greater use of simultaneity rather than sequencing, as we saw in the grammatical phenomena discussed in the previous section. Yet our comparison with spoken languages shows that ASL only takes the possibilities for simultaneity in the UG of spoken languages and extends them to a greater degree. This exploitation of simultaneity is possible because the hands and face have more independent degrees of freedom than the vocal tract—they can do more different things at once. But the abstract principles that organize these degrees of freedom are drawn from the same menu.

Returning to the main theme of this book: What does ASL tell us about language and about human nature? In previous chapters, we came to think of language as a complex relation between thought and speech, with two codings enroute, phonological and syntactic structure. We now have to generalize that characterization to include sensorimotor modalities other than speech. Figure 7.7 (next page) incorporates this revision into our earlier diagram of the overall organization of language.

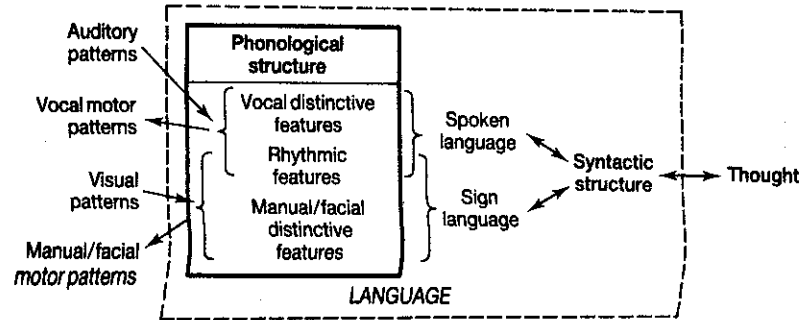


Figure 7.7 *Information flow in spoken and signed language*

Thus ASL serves to emphasize the *abstractness* of linguistic organization—its independence from sensorimotor modality. In using language, we're doing a lot more than simply associating sounds (or signs) with meanings. Most of the richness of language comes from *inside* the mind, from the way our mental grammars unconsciously create structure that gives meaning to sensory patterns. Moreover, much of the structure is now seen to be indifferent as to the modality of the sensory patterns. And it is learned on the basis of innate organization of the brain, built to tune itself to language-like patterns in the environment, whether auditory or visual.

As for human nature, we should continue to keep in mind the question: If the organization of language and language learning is this complex, rich, abstract, flexible, and unconscious, what about everything else we do? Stay tuned for Part IV. But first, we have some further business regarding language.