1 Seeing Is Believing

A CONSTELLATION OF anatomical and social peculiarities distinguish human beings from other mammals. These anatomical attributes include upright posture with a striding bipedal gait; relative hairlessness; a brain that is large in comparison to the size of the rest of the body; aspects of the dentition and the anatomy of the jaw and throat; and, most significantly for purposes of this book, an exceptionally dexterous hand with full opposability of the thumb to the other digits. It is particularly instructive to look at these anatomical peculiarities in comparison with similar attributes of our closest living relatives, the higher primates—in particular the great apes of Africa. We will also consider the social arrangements of these primates as they compare to those of humans—in this regard, we will be particularly concerned with the need for complex and often subtle communication systems that support flexible and dynamic small-group interactions.

History of the Human Hand

Why start a book about human sign languages with a discussion of our relationships to our primate relatives? Human beings have long indulged in speculation about the origins of their languages. Visible gesture and the signed languages of the deaf have, as we will see, figured prominently is this speculative literature. Because some scholars have argued that the original human languages were gestural or signed languages, as we

attempt to reconstruct their histories it is worth returning to the beginnings of the human lineage. However, this book does not explicitly make the argument for a gestural origin of human language. That has been done elsewhere by a number of authors, including this one. This book illustrates the important ways in which these visible languages have enriched human culture in general and shows how their study has expanded knowledge of the human condition, from the point of view of the Western intellectual tradition in particular.

Human visible gestures can involve virtually all parts of the human body that can be seen by a person's interlocutor, and it is now well known that this is equally true of the sign languages of deaf people—languages that were once referred to as "manual." It is important, therefore, to explain why this book takes the apparently anachronistic approach of concerning itself primarily with the expression of those languages through symbolic activity of the hands. It is argued here that these symbolic activities have a special importance in the expression of signed languages and a significance in human culture that frequently rises to a mystical level. This is simply because of the hand's dexterousness, as mentioned above. The hand is capable of degrees of contrast with respect to symbolic distinctions that gestural behavior involving other parts of the body, for example through changes in facial expression, is not.

Symbolism involving the hands, especially the distinction between the right and the left hand, is ubiquitous in human culture and was a focus of early cross-cultural anthropological research. What this pan-cultural symbolic attribution highlighted, of course, is another uniquely human trait—handedness—and the predominance of the right hand in particular. Although there may be precursors to human handedness among the African apes (see figure 1), nothing exists in the

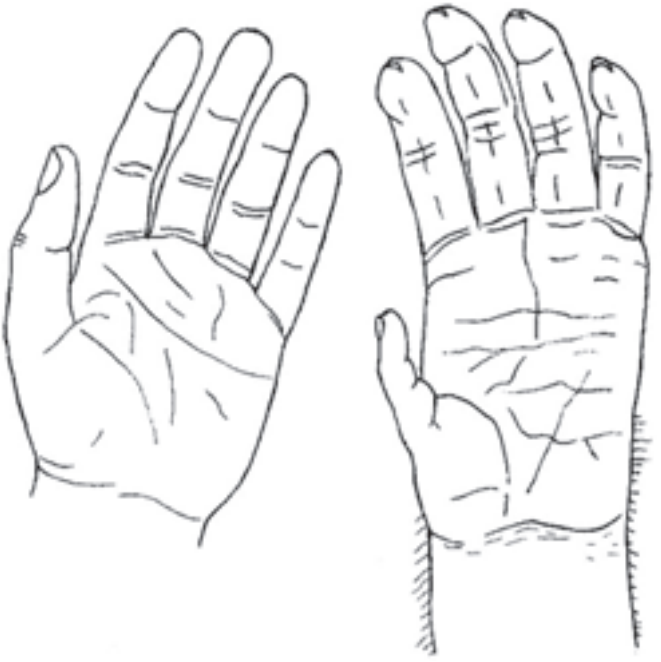

Fig. 1. Hands of human and chimpanzee. Illustration by Robert C. Johnson.

nonhuman primate world that approaches the universal development of skilled behavior by the right hand among modern human populations. It has been known, moreover, since the work of the French anthropologist, Paul Broca, in the nineteenth century, that handedness and aspects of the production of spoken language generally depend upon structures in the left cerebral cortex of the human brain.

As early as 1909, the French sociologist, Robert Hertz, attempted to account for aspects of the cross-cultural right/left dual symbolism by reference to Broca's work on the neurology of handedness and language. What is striking about this cross-cultural literature is the near universal association of the

right with positive and the left with negative attributes. In English, the word *dexterous* comes directly from the Latin word for right, while *sinister* is derived from Latin for left. From cross-cultural studies of right/left symbolism compiled by the anthropologist Rodney Needham (1973), we find such widely distributed associations as these:

- Right—strong, social order, senior, esteemed, auspicious, life, eating
- Left—weak, disorder, junior, hated, inauspicious, death, eliminating

Hertz sums up the difference in the following terms:

> What resemblance more perfect than that between our two hands! And yet what a striking inequality there is! To the right hand go honors, flattering designations, prerogatives: it acts, orders, and takes. The left hand, on the contrary, is despised and reduced to the role of humble auxiliary: by itself it can do nothing; it helps, it supports, it holds. (1973, 3)

How, then, did the hand, especially the right hand, come to occupy such a central place in so many aspects of human behavior? In his influential book, *The Hand: How Its Use Shapes the Brain, Language, and Human Culture,* the neurologist Frank Wilson summarizes the essential anatomical adaptations of the primates that made them successful tree dwellers:

1. orbits and eyes moved to a forward position in the head, permitting binocular vision, certainly an advantage for navigating in three-dimensional space and for finding and catching small prey at close distances;
2. forearm and collarbone structure were modified to permit greater flexibility and perhaps greater safety in arboreal travel and dining;

3. paws that retained the archaic but extremely useful five-ray (pentadactyl) pattern, permitting the animal to grasp with individual digits; toes and thumbs acquired the ability to close the gap between the thumb and first digit (i.e., they became convergent, though not yet opposable); nails replaced claws on the dorsal surface of terminal digits, while palmar surfaces acquired sensitive, ridged pulps—all these changes permitted improved climbing and locomotion along trunks and branches, and better grasping and holding of fruits, leaves, and insects;
4. the snout shortened, vision began to supersede smell as the dominant sense, and jaws, skull, and teeth changed, consistent with dietary change;
5. the brain changed in size and configuration, probably to accommodate the geometrically more complex living and hunting environment. (1998, 19–20)

The central thesis of Wilson's book is that the nexus implied here between powerful binocular vision and hands capable of fine manipulation set the stage for the eventual evolution of human beings as makers and users of tools and as successful communicators through visible gesture. Within the primate order, it was human beings who took greatest advantage of this potential for coordinated activity involving hand and eye.

At some point during the evolutionary history of the primates, the hominoids, the superfamily to which humans and apes belong, developed a further specialization related to locomotion. This has been called brachiation or brachiation with "knuckle-walking." This mode of locomotion involves hands with relatively long, hooklike fingers and short thumbs. Apes can thus move through trees by arm-over-arm swinging or by grasping tree limbs from underneath with their hooklike

hands and prehensile feet, rather than by running along the upper surfaces of branches like monkeys. On the ground, apes, especially chimps and gorillas that spend much of their time out of the trees, walk on the knuckles of their hands, not the palmar surfaces. However, given their elongated fingers and short thumbs, apes have difficulty bringing their thumbs into full opposition with the palmar surfaces of their fingers—thus, limiting the extent to which they can form precision grips, a hallmark of the human hand.

We should, then, look closely at the anatomy and function of the human hand, within the context of its recent evolutionary history. Very early in the hominid (now often referred to as the hominin) lineage, the lineage leading to modern humans, the evidence concerning the evolution of the hand indicates that the following functional capabilities, characteristic of modern humans, seem to have emerged:

- the thumb, index, and middle fingers can form a "three-jaw chuck," which means the hand can conform to, grasp, and firmly retain irregular solid shapes (such as stones);
- finer control can be exerted over objects held between the thumb and the tips of the index and middle fingers;
- rocks can be held within the hand to pound repeatedly on other objects (nuts, for example), or to dig for roots, because the new wrist structure is able to absorb (dissipate) the shock of repeated hard strikes more effectively than in the ape hand. (Wilson 1998, 26)

As was alluded to above, it is not only the configuration of the hand itself that is significant, but also the neurological specialization of handedness that establishes the unique functional capabilities of human hands. Although some variation in published estimates exists, clearly the vast majority of modern

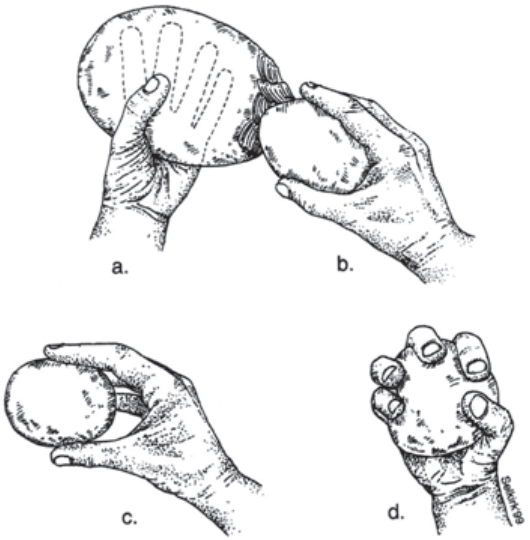

Fig. 2. Human grips. Reproduced with permission from Marzke and Marzke 2000. © John Wiley and Sons.

human beings, up to 90 percent, are right handed—showing a strong preference for using the right hand to perform most skilled activities. Some evidence for handedness in nonhuman primates has been found, not surprisingly among chimpanzees in particular (Hopkins 1999), but most scientists accept that the degree of preference and the prevalence of the right as the preferred hand constitute a uniquely human trait.

This sort of manual dexterity allows humans to use their hands to mimic and thereby represent all sorts of objects and actions. Two downward pointing fingers making a scissoring action can represent a person walking, for example, and five wiggling fingers can represent a spider or other animal. Some of these gestures may be understood almost universally. The 'L' hand held with the finger pointing out and the thumb point-

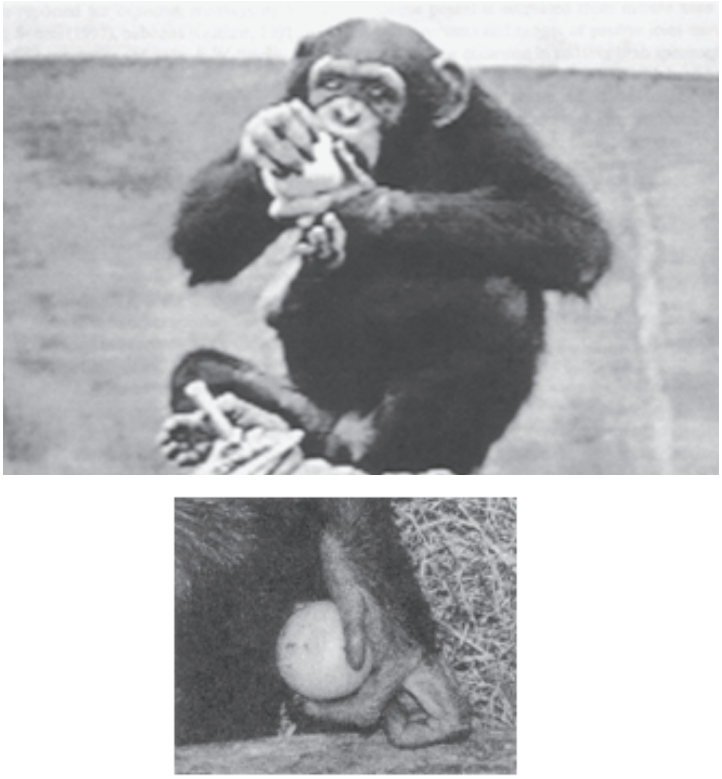

Fig. 3. Chimpanzee grips. Top photo reproduced with permission from Marzke and Marzke 2000. © John Wiley and Sons. Bottom photo reproduced with permission of the Michale E. Keeling Center for Comparative Medicine and Research, Department of Veterinary Sciences, The University of Texas MD Anderson Cancer Center.

ing up represents a handgun anywhere in the world where such weapons exist. The 'Y' had held with the pinky at the chin and the thumb at the ear represents a telephone everywhere there are telephones. And so on. No other part of the human anatomy is capable of creating signs with this degree of distinctiveness.

Seeing and Hearing

One of the most delightful scenes in all of theater is the play within the play in *A Midsummer Night's Dream* that the Athenian menials present to Duke Theseus and his Amazonian bride, Hippolyta (act V, scene 1). In the middle of this farce, Bottom the weaver, as Pyramus, addresses his beloved Thisbe, who has been speaking on the other side of a Wall: "I see a voice: now will I to the chink, To spy an I can hear my Thisbe's face." Now, as with so much in Shakespeare, this passage has been treated as more than the author intended it to be—a gentle burlesque replete with malapropisms. The first part of Pyramus's line, "I see a voice," has inspired the titles of at least two books about deafness and deaf people: Oliver Sacks's (1989) *Seeing Voices* and a more recent philosophical work by Jonathan Rée (1999) entitled, simply enough, *I See a Voice.* There is some fairly obvious symbolism here that we don't need to dwell on—of course when we see deaf people signing, we are in some way seeing their "voices." Instead, it would be worthwhile to consider the second part of Pyramus's line—"To spy an I can hear my Thisbe's face." Just as we can see the voices of deaf people as they sign, so, equally, can we "hear" faces, assuming of course that we can hear at all. Consider this quotation from another familiar classic of English literature, Dickens's *Christmas Carol:*

> Oh! But he was a tight-fisted hand at the grindstone, Scrooge! A squeezing, wrenching, grasping, scraping, clutching, covetous old sinner! Hard and sharp as flint, from which no steel had ever struck out generous fire; secret, and self-contained, and solitary as an oyster. The cold within him froze his old features, nipped his pointed nose, shriveled his cheek, stiffened his gait; made his eyes red, his thin lips blue; and spoke out shrewdly in his grating voice. A frosty rime was on his head, and on his eyebrows, and his wiry chin. He carried his own

> low temperature always about with him; he iced his office in the dog-days, and he didn't thaw it one degree at Christmas. (chapter 1)

Only one species of creature alive on Earth is capable of doing what Dickens does here—cause us to construct a visual image of old Scrooge simply by describing his appearance. In this case through writing—but the description works equally well, or perhaps better, when delivered in spoken words.

Psychologists have written much about the importance of what may be another uniquely human neurological attribute—cross-modal association, the ability to freely combine sensory input from more than one modality, that is, vision, hearing, and sense of the body, into higher order concepts and images. It can be argued that a primary function of metaphor and other figurative spoken language is to enable the translation of essentially visual information into the abstraction that sound is to us. Not surprisingly, the only other mammal that seems to share this ability with us, again if only minimally, may be the chimpanzee. Cross-modal transfer of sensory information is associated with the cortex of the parietal lobe, one of the parts of the brain that has grown dramatically during the course of human evolution. This functional region is also sometimes referred to as the POT—parietal/occipital/temporal area. But why would this sort of sensory integration be so important to the appearance of human language?

One of the many curious things about language is that for most people it is not expressed and perceived in the dominant human sensory modality, which, unquestionably, is vision. We are primates, and because we are primates, when we gather information about the world, we gather it primarily through our eyes. Primates are so visually oriented presumably because their ancestors' primary adaptation was arboreal, that is to life

in the trees. Why would vision be so important to animals that live in trees? Armstrong, Stokoe, and Wilcox (1995, 48) have noted a very simple, very draconian Darwinian explanation—a leaping monkey that misses its grip is likely to be a dead monkey. This mode of life, especially when it involves feeding on small food items such as insects and fruits, also requires a great deal of manual dexterity and eye-hand coordination, all of which, as we have seen, are hallmarks of the primate adaptation.

Because we are so visually oriented, it is hard for us to imagine the sensory capabilities of some other animals. When we want to know the truth about a crime, we *look* for an *eyewitness* who *saw* it done. We tend not to accept *hearsay. Seeing,* after all, is believing. But if we were carnivores and not primates, we would probably want to sniff out a nose-witness. Just as we cannot *picture* how a dog constructs its olfactory world, we find it similarly hard to *visualize* the way in which a bat or a dolphin is able to detect the shapes of distant objects using its auditory sense, through a process called *echolocation*. In this case, the sounds perceived by the animal were also created by the animal, but this extraordinary sensory feat is carried out completely in the auditory medium. The information carrying capacity of the auditory sense in humans and other primates is much more limited. When you were trying to conjure up Scrooge's face, you were using your mind's eye, not your mind's ear. We can certainly make some judgments about the type of an object or animal and its approximate location by the sounds that it makes, but to understand the difference between the human senses of sight and hearing, we need only contrast the relative ease of mobility of deaf people and blind people. Who is more at risk walking near a cliff on a still day, a deaf person or a blind person?

If our sense of hearing is so inferior as an information-gathering device, why do we use it to support what is undeniably our most important communication and information-gathering system—language? Why should this be so when we consider that language may be the hallmark of our humanity? Let's consider what makes this possible—cross-modal sensory association or transfer in humans. This form of association in nonhuman primates seems to require reinforcement to make the link; that is, these animals may lack voluntary control over this sort of multisensory conceptual integration. The ability to abstract out a mental construct that involves a variety of sensory input allows us to attach arbitrary or conventional signs to these concepts, and it may have been one of the key human adaptations enabling speech. Why did speech become so dominant? Many commonsense explanations have been suggested: It works much better in the dark, it frees the hands for carrying objects and making tools, it may be more energy efficient, it does not require directed visual attention, etc. We need not dwell on these here—the point is that speech did become the dominant mode of communication for all hearing human societies.

If we think of a disability as something that reduces a person's capacity to function within a certain domain of behavior, then we might not classify blindness and deafness as sensory disabilities. Instead, we might say that blindness is primarily a mobility impairment and that deafness is a communication (but not language) disability. While we can readily understand this difference between the blind and the deaf, it is important to note that it is firmly rooted in the evolutionary history of the primates. The higher primates evolved as arboreal creatures that traveled rapidly from tree to tree through forest habitats by leaping and grasping limbs with their hands and feet. Vision

was their master sense, and their hands and feet had to remain generalized, for grasping and manipulating objects, as well as for locomotion. Again, it is hard to imagine a blind arboreal monkey surviving past infancy, but all human societies include blind adults. One contributing factor is that blind people do not suffer from an inability to communicate their special needs through speech. Blind people might in some situations be seen as having special functions—as in the case of the probably legendary Homer, as a keeper of the oral (auditory) tradition.

On the other hand, the primary difficulty experienced by deaf people is precisely in the realm of communication, and in this regard we will consider the circumstances under which visible/gestural languages may develop and spread. This book argues that a central part of the human adaptation is intensive development of the higher primate capacity for successful group action, which, of course depends ultimately on the ability to communicate effectively. This book is not about the visible gestures that ordinarily and spontaneously accompany informal speech in all known human societies—instead it is about what is known of the history of visible gestures, especially those involving the hands, and signs that serve functions distinct from speech (although this distinction cannot always be precisely maintained, and we will occasionally stray into the former realm of discourse for illustrative purposes).

What Is Language?

This book uses a utilitarian definition of language. All human societies so far identified on Earth have languages, and if the users are not deaf, their primary language will be spoken. If they are deaf and are left unmolested by educators, physicians, and linguists, their primary language will be signed. We can take it as axiomatic, therefore, that all human beings have

the capacity to develop and acquire languages in media that are accessible to their operating senses and musculoskeletal output systems. If we find a sign system operating as the primary mode of communication for a definable social group, we can conclude that it is a language. Sign systems used as secondary modes of communication, as are some encountered in this book, may be more problematic in this regard. Language scholars have, in the past, developed checklists of essential attributes of languages—for example the design features enumerated by Charles Hockett in 1960. This book avoids detailed formal definitions but includes for consideration and examination sign systems that appear capable of supporting the weight of most ordinary human interactions.

This work assumes that a continuum of linguistic complexity of manual gesture exists, from isolated gestures accompanying speech to full-fledged visible languages expressed fully in the sign languages of deaf communities. This capacity for linguistic elaboration is always there to be tapped, when needed or desired, in all human populations. The existence of this continuum presupposes fundamental processes whereby originally transparent or iconic signs become increasingly opaque or arbitrary through conventionalization or ritualization. Adam Kendon suggests that what is involved is not a simple one-dimensional continuum from more iconic to more conventionalized, however. Simple but conventionalized gestures that accompany speech may be more or less iconic, or not iconic at all. With respect to the latter point, Kendon (2004, 106) discusses the so-called "ring" hand, in sign language notation the 'F' hand. This is generally used to express approbation for a point made in conversation or for "perfection"—it is widely understood, and therefore conventionalized, but it

Fig. 4. The "F" handshape. Illustration by Robert C. Johnson.

does not appear iconic in any obvious way. The hands can be used to signify or denote a huge variety of concepts, and the shapes that do the signifying are subject to complex processes of conventionalization through use. The central argument being advanced, however, is that the potential for direct iconic representation by the hands provides the great wellspring for the emergence of new signs and, ultimately, the emergence of new human languages.

Before leaving this topic, however, it is worth considering an argument that suggests that the "ring" hand, OK gesture, or 'F' hand—however designated—may, in fact, have iconic roots deep in the evolutionary history of the human lineage (see figure 4). As the eminent anatomist and evolutionary anthropologist, John Napier, wrote:

> In man, the most precise function that the hand is capable of is to place the tip of the thumb in *opposition* to the tip of the index finger so that the pulps of the two digits make maximum contact. In this position, small objects can be manipulated with an unlimited potential for fine pressure adjustments or minute directional corrections. Opposition, to this degree of precision, is a hallmark of mankind. No nonhuman primate can replicate it. Although most people are unaware of the

> evolutionary symbolism of this finger-thumb opposition they cannot be unaware of its implication in international sign language; it is the universal gesture of human success. (1970, 181)

Napier does not suggest a distinct dividing line between the gestural and the linguistic, between nonlanguage and language. However, growth in the complexity of a gestural system entails the emergence of a conventionalized and componential substructure (phonology), rules for combining these elements (morphology), and methods for expressing relations among actions and objects (syntax). The emergence of these structures can be directly observed in the processes by which sign languages develop.

With regard to this functional approach to distinguishing linguistically organized from nonlinguistic gesture, it is important to understand recent developments in the discipline of linguistics, especially the controversies that have surrounded the elaboration of the nativist or generative school of linguistics founded by Noam Chomsky in the 1950s. These developments can be contrasted with an older, anthropological approach to linguistics and more recent progress in what has come to be called cognitive linguistics. At the heart of this controversy is the question of whether the human ability to construct and use languages is a genetically determined special trait or whether it emerges as a result of the application of more general cognitive abilities to the need to communicate about complex topics within social groups. Much about the regularity of the organization of spoken languages suggests a specific genetic determination. The well-known linguist and writer, Steven Pinker, summarizes this evidence as follows:

> Chomsky's claim that from a Martian's-eye view all humans speak a single language is based on the discovery that the same symbol-manipulating machinery, without exception, underlies

> the world's languages. Linguists have long known that the basic design features of language are found everywhere. Many were documented in 1960 by the non-Chomskyan linguist C. F. Hockett in a comparison between human languages and animal communication systems (Hockett was not acquainted with Martian). Languages use the mouth-to-ear channel as long as the users have intact hearing (manual and facial gestures, of course, are the substitute channel used by the deaf). A common grammatical code, neutral between production and comprehension, allows speakers to produce any linguistic message they can understand, and vice versa. Words have stable meanings, linked to them by arbitrary conventions. Speech sounds are treated discontinuously; a sound that is acoustically halfway between *bat* and *pat* does not mean something halfway between batting and patting. Languages can convey meanings that are abstract and remote in time or space from the speaker. Linguistic forms are infinite in number, because they are created by a discrete combinatorial system. Languages all show a duality of patterning in which one rule system is used to order phonemes within morphemes, independent of meaning, and another is used to order morphemes within words and phrases, specifying that meaning. (1994, 237–38)

It should be clear that sign languages might provide a test of the notion that languages are this rigorously constrained by genetic determination, in that, in contrast to spoken languages, they are organized within a completely different sensory medium, and they use a completely different set of musculoskeletal output systems. In fact, they have been used as evidence of both positions with respect to the biological foundation of the human capacity for language—specific genetic determination and general cognitive underpinnings. In this book, I will explore this question in some detail. According to linguists such as Pinker, there is language and not-language—there are no intermediate forms of communication or gradations between gesture and language. This book will argue that such gradations do exist and that gestural systems

can become increasingly language-like through time and use. It will also be argued that, because of the fundamental iconicity of all sign languages, they do not have the sort of distinct duality of patterning that Pinker specifies as a hallmark of all languages. That is, on no level are the organizing principles of sign languages completely meaningless, as is true at the level of the phoneme in speech. For example, in sign languages big things are represented by big movements or spaces and small things are represented by small movements or spaces. Up means up and down means down, right means right and left means left, and so on. Nothing in speech compares to this. I also maintain categorically here that there is nothing primitive about this sort of organization—the sign languages of deaf people are complex and highly evolved, and they serve the same functions as the spoken languages of hearing people. It is just that they are transmitted and received in a different medium, and they take full advantage of that medium. As we will see, these languages have much to tell us about how to optimize communication in the visual medium, as our ability to exploit that medium expands exponentially through use of computers and the Internet.

With respect to their status as possible test cases, situations in which complex gestural or signing systems are known to have arisen include the following:

- In social groups that include a large proportion of deaf people;
- Among hearing people for use in situations where noise or distance impede vocal communication;
- Among hearing people for use as a *lingua franca;*
- Among hearing people who must be silent for religious or other reasons.

We will encounter examples of each of these cases, and this book will show what we can learn about the human capacity for language and communication by studying instances of human signing within a broad range of social contexts and geographic locations. A general goal will be to see what we can learn about the human condition in general by studying these exceptionally interesting examples of human behavior.