

# **North American Indian Signed Language**

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## **Varieties: A Comparative Historical**

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### **Linguistic Assessment**

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As an alternative to spoken language, signed language has been observed and documented for certain North American Indian groups (e.g., Davis 2005, 2006; Davis and Supalla 1995; Mallery 1880, 1881; McKay-Cody 1997; Taylor 1978, 1997; Tomkins 1926; Umiker-Sebeok and Sebeok 1978).<sup>1</sup> The North American continent was once an area of extreme linguistic and cultural diversity, with hundreds of distinct and mutually unintelligible languages spoken by the native populations. For example, Mithun (1999, 1) points out that “while the languages of Europe are classified into just three families, Indo-European, Finno-Ugric, and Basque, those of North America constitute over 50.”

The major published research on the languages of native North America (reported in Campbell 2000 and Mithun 1999), early anthropological linguistic fieldwork and descriptions (Kroeber 1958; Voegelin 1958; West 1960), and a survey of documentary materials from archival sources (Davis 2006) indicate that signed language was used in varying degrees as an independent communication system within most of the language families indigenous to North America. For many generations, signed language emerged as a way to make communication possible between individuals and groups speaking many distinct and mutually unintelligible languages.

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This was documented in numerous historical accounts, including the fieldwork of nineteenth-century ethnologists and anthropologists, most notably Boas (1890) and Mallery (1880, 1881), who were among the first scholars to do fieldwork among American Indian groups.

This chapter focuses on previously collected lexical descriptions from written, illustrated, and filmed sources of conventionalized signs that were used among North American Indian groups for a variety of discourse purposes (reported in Davis 2006). The chief aims of the present study are (1) to provide a preliminary assessment of historical relatedness, language variation, and dialect differences based on lexical comparisons of signs used among North American Indians of the Great Plains; (2) to compare the signs documented for North American Indians with lexical descriptions and illustrations of American Sign Language (ASL) from comparable historical periods; and (3) to point others to the corpus of North American Indian signed language so that various linguistic levels — from the phonological to the grammatical — can be further studied and described. Documenting and describing a language are enormous undertakings that are rendered urgent by the endangered status of these signed language varieties. The study of indigenous signed languages helps broaden our understanding of the cognitive and social bases of human language and raises historical linguistic and sociolinguistic questions (e.g., about language origins, spread, attitude, contact, change).

## **PREVIOUS STUDIES**

I have previously reported on the documented cases of historical and contemporary signed language use among North American Indian groups, and some of these findings are summarized in the following sections (see Davis 2006 for further descriptions).<sup>2</sup> The previously collected historical linguistic and ethnographic documentation from archival sources indicates that signed language was used across the major American Indian cultural areas (e.g., the Southeast, Gulf Coast, Southwest, Great Plains, Plateau/Great Basin, Northeast, Subarctic, and Mesoamerican geographic areas; Campbell 2000; Davis 2005, 2006; Mithun 1999). A number of volumes have been published on the traditional use of signed language among American Indians (most notably, Clark 1885; Mallery 1881; Tomkins 1926; Umiker-Sebeok and Sebeok

1978), and more recently, several publications have described both the historical and contemporary use of signed language among Indian groups (Davis 2005, 2006; Davis and Supalla 1995; Farnell 1995; Kelly 2004; Kelly and McGregor 2003; McKay-Cody 1997).

In the research literature, the historical varieties of indigenous signed language specific to North America are sometimes collectively referred to as “North American Indian Sign Language” (see Wurtzburg and Campbell 1995). Historically, these varieties of signed language were named in various ways: Plains Indian Sign Language (PISL), Indian Sign Language, the Sign Language, and Indian Language of Signs. “Hand talk” was the way that some American Indian groups commonly referred to sign language (Tomkins 1926). In this chapter these terms are used interchangeably depending on the historical context and sources that are cited.

### **Early Anthropological Linguistic Fieldwork**

The first works to describe the distinctive features of conventionalized signed language among American Indians were published by researchers (Kroeber 1958; Voegelin 1958; West 1960), who helped establish the discipline of anthropological linguistics. Based on these findings and other historical accounts reported in the literature (cf. Campbell 2000; Davis 2005, 2006; Mithun 1999), linguistic variation was observed within and between different North American Indian groups that used signed language (e.g., not all of the members of the group may have signed, and those who did sign may not have been equally fluent). Reportedly, the more nomadic groups were the best signers; dialect differences were evident but did not seriously hinder communication; and signing was not limited to intertribal ceremonial occasions but was also used in storytelling and conversation within groups speaking the same language. Moreover, signing occurred both with and without speech as an alternative to spoken language for Indians who were hearing and as a primary language for those who were deaf. For further descriptions see Davis (2005, 2006).

### **Contemporary Documentation and Description**

Davis (2005, 2006), Davis and Supalla (1995), Farnell (1995), Gordon (2005), Kelly (2004), Kelly and McGregor (2003), and McKay-Cody (1997) have reported that the traditional ways of signing are currently known primarily by hearing elders and some deaf members of several

different American Indian language groups. The number of signers is unknown at this time, but due to a variety of sociocultural and historical factors reported in these studies, traditional sign language use among hearing Indians has been replaced by spoken English. Most of the deaf members of these groups attend schools for deaf students and learn ASL as a primary language. Thus, fewer hearing and deaf Indians are learning the traditional ways of signing, suggesting that these varieties of sign language are currently endangered. Although greatly diminished from once having been used among dozens of distinct Native American cultural groups, contemporary sign language use has been reported (see Davis 2006) within seven distinct spoken language groups, representing four major spoken native language families:<sup>3</sup> Algonquian (Blackfoot = Piegan, Northern Cheyenne), Athabaskan (Navajo = Diné), Siouan (Assiniboiné, Crow, Sioux = Lak(h)ota = Dakota = Nakota), and New Mexican Pueblo Isolates (Keresan = Keres). It has been reported (Davis and Supalla 1995; Kelly and McGregor 2003) that some members of the Navajo/Diné and Keresan groups use a signed language variety that is distinct from those used by Plains cultural group members, primarily of Algonquian and Siouan descent (Farnell 1995; Mithun 1999; McKay-Cody 1997; West 1960).

### **Primary and Alternate Sign Language**

Davis and Supalla (1995) and McKay-Cody (1997) studied the similarities and differences between deaf and hearing Indian signers and between signing that occurs with or without speech. For example, the “alternate sign systems” used by hearing Indians became a “primary sign language” when acquired natively by deaf Indians. The linguistic evidence suggests that alternate signs are used to varying degrees of proficiency, ranging from those that accompany speech, to signing without speech, to signing that functions similarly to a primary sign language. Davis and Supalla (1995, 83–85) have proposed that (1) *primary signed languages* have evolved within specific historical, social, and cultural contexts and have been used across generations of signers (e.g., ASL, French Sign Language, British Sign Language) and that (2) *alternate sign systems* have been developed and used by individuals who are already competent in spoken language (e.g., the highly elaborated and complex sign system used historically by the Plains Indians of North America).

McKay-Cody (1997) has described what happened when the alternate sign language traditionally used by hearing members of the Plains cul-

tural groups was acquired as a primary sign language by members of the group who are deaf. The deaf members of these native groups “seem to gain a higher level of proficiency” when compared to members who are hearing (ibid., 50). These findings suggest that the alternate sign language becomes linguistically enriched when learned as a primary language by members of these native communities who are deaf. Further historical (diachronic) and contemporary (synchronic) comparative linguistic analyses are needed to clarify these similarities and differences and to assess the historical relatedness or unrelatedness among these signed language varieties.

### **Plains Indian Sign Language**

Previous anthropological linguistic field research showed that sign language was used in varying degrees within most of the spoken language families of Native North America and that the best-documented cases involved members of the Plains Indian cultural and linguistic groups (Kroeber 1958; Voegelin 1958; West 1960). Historically, the Great Plains cultural area was centrally located on the North American continent and spanned approximately one million square miles. Intensive language and cultural contact occurred between the native peoples inhabiting these areas (cf. Campbell 2000; Mithun 1999). It should be pointed out that these cultural-linguistic boundaries are based on numerous sociocultural, linguistic, and historical variables and do not imply the existence of only a few sharply distinct ways of life on the continent (e.g., Washburn, in the *Handbook of North American Indians* [1988, viii], states that “in reality, each group exhibits a unique combination of particular cultural features, while all neighboring peoples are always similar in some ways and dissimilar in others”).<sup>4</sup>

Traditionally, Plains Indian Sign Language (PISL) is used within the Plains cultural and linguistic groups of the United States and Canada (Gordon 2005). Documentary materials on PISL are the primary source of the lexical comparisons presented in this chapter. Davis (2006, 8) reports that “historic and contemporary uses of signed language have been documented in at least one dozen distinct North American language families (phyla)” and that “the archived data reveal that regardless of hearing status, signing was used by members from approximately thirty-seven distinct American Indian spoken language groups.” Although greatly diminished from its former widespread use across the Great Plains, PISL has not vanished. Gordon (2005) classifies PISL as a language that is distinct

from ASL. Today PISL is used within some native groups in storytelling, rituals, legends, and prayers, as well as by American Indians who are deaf (Davis 2005, 2006; Davis and Supalla 1995; Farnell 1995; Gordon 2005; Kelly 2004; Kelly and McGregor 2003; McKay-Cody 1997).

### **Origins and Spread**

The origins of North American Indian signed language varieties remain uncertain. From the sixteenth through the nineteenth centuries, numerous descriptive accounts of the signing of American Indians were written by early European explorers who spent years in the area and colonizers who settled in North America (Mithun 1999). In their historical study of “North American Indian Sign Language,” Wurtzburg and Campbell (1995, 160) have defined “sign language” as “a conventionalized gesture language of the sort later attested among the Plains and neighboring areas.” Goddard (1979) and Wurtzburg and Campbell (1995) have made compelling cases for a preexistent, well-developed indigenous sign language that was used across the Gulf Coast–Texas–northern Mexico area before European contact, and these scholars have also discussed the pidgins, trade languages, and mixed systems used by native groups. The generally accepted hypothesis among scholars (see also Campbell 2000; Mithun 1999) is that North American Indian Sign Language (Wurtzburg and Campbell’s designation) originated and spread from the Gulf Coast, became the intertribal *lingua franca* of the Great Plains, and spread throughout the Northwest Territories of the United States and Canada.<sup>5</sup> Along these lines, Taylor (1997, 275) proposes that “trade may have been an important stimulus in the development of sign language, and it was certainly an important factor in its diffusion after the rise of horse nomadism.”

### **Evidence of a Historical Signed *Lingua Franca***

During the nineteenth and early twentieth centuries, signed language use among native groups was so widespread that scholars of this period considered it to be a *lingua franca*. In other words, signing was used between indigenous groups who did not otherwise share a common spoken language (Clark 1885; Scott 1931; Mallery 1880; Tomkins 1926). Previously, documentation was made by some of the philologists and ethnologists who worked at the Smithsonian Institution’s Bureau of Ethnology and were among the first scholars to do fieldwork with American Indian groups (most notably Boas 1890 and Mallery 1880).

The previous documentation occurred before the decline in the use of indigenous sign language due in large part to its replacement by English as a lingua franca (Davis 2005, 2006). Following Mallery's seminal research on this subject at the Smithsonian Institution (1880–1900), a fifty-year time period elapsed before additional peer-reviewed studies of Indian Sign Language were resumed and published by qualified and recognized researchers (e.g., Kroeber 1958; West 1960; Voegelin 1958).<sup>6</sup> These early scholars laid the groundwork for the consideration of Indian Sign Language as a preexistent, full-fledged language (Davis 2006).

Kroeber (1958) and Voegelin (1958) published the first scholarly works describing the conventionalized signs used by American Indians in terms of distinctive features similar to the sounds of spoken language. This was followed by a two-volume doctoral dissertation written by LaMont West, one of Carl Voegelin's students (1960). Kroeber, Voegelin, and West developed an elaborate transcription system and phonemic-like inventory for Indian Sign Language of the Great Plains cultural area and were the first scholars known to describe the distinctive phonetic features of a sign language in terms of handshape, place of articulation, and movement. For example, handshape features were described as open, closed, fingers extended, straight, curved, and so on; different points on the body were considered places of articulation; and the movement patterns of the hands were described in detail (e.g., up, down, left, right, repeated, straight lines, curves, circles) and included one hand acting alone, as well as one stationary and the other active, with both hands moving in parallel or interacting.

The published research on Indian Sign Language helped inform and was cited in the seminal work of some of the first signed language linguists (e.g., Stokoe 1960, 1972; Battison 1978/2003). However, the same biases that delayed the recognition and academic acceptance of ASL as a distinct language also appear to have contributed to the oversight and neglected study of sign language among American Indian groups (Baynton 2002). There has been a general lack of understanding about the nature and structure of indigenous sign language even though it has been observed and reported since the 1500s (Davis 2005, 2006). Perhaps this area of sign language studies has been neglected for the past several decades due to the understandable need to provide linguistic descriptions of the primary sign languages of Deaf communities. A review of the previous linguistic and ethnohistorical studies of indigenous sign language will bridge some of the gaps in the research, encourage further studies of

this subject, and draw attention to this little-known and often overlooked part of Native American heritage and sign language studies.

### **West's Studies**

One of the major contributions of West's (1960) research was the observation that signed language use exhibited the same duality of patterning as spoken language. In addition to the structural properties and production of sign language, West and his colleagues carefully examined the lexicon, semantics, and possible origins of the system.<sup>7</sup> During the late 1950s West conducted extensive anthropological linguistic fieldwork among Plains tribal groups over a period of several years and reported that a number of Native American groups used different varieties and dialects of sign language. His study of more than one hundred American Indian informants reported that 87 percent were fluent in sign language (1960, 2, 62–68). Mithun (1999, 293) writes that “when La Mont West visited Plains communities in 1956 he found signing still practiced, particularly on intertribal ceremonial occasions but also in storytelling and conversation, even among speakers of the same language.”

Taylor (1997, 276) points out that West's findings show that, by the 1950s, sign language was known primarily by the elders (77 percent of West's informants were older than sixty years of age, including 18 percent who were past eighty) and that the shift away from the use of sign language as an alternate to spoken language was due largely to its replacement by English as a lingua franca (55 percent of West's informants were fluent in English, whereas only 18 percent knew more than one of the Indian languages). See West (1960, 2, 62–68) for a summary of these findings.

West's fieldwork focused primarily on groups of the northern Plains cultural area, but he reported that dialect groups also lived beyond this geographic area. West identified a major dialect split between the Northern Plains and native communities beyond this region: (1) a North Central Plains dialect referred to as Plains Standard and (2) a Far Northern Plains dialect referred to as Far Northern or Storytelling dialect, which was used mainly in the Canadian provinces of Alberta, Saskatchewan, Manitoba, and British Columbia. More recent studies (e.g., Davis 2006; Mithun 1999; McKay-Cody 1997) have also suggested that different varieties and dialects of sign language were used among Indian groups and that these were distinct from the variety of ASL used in North American Deaf communities.



## THE PRESENT STUDY

Comparative historical linguistic analyses are necessary before we can reach conclusions about historical relatedness and the outcomes of language contact between the signed language varieties used by American Indians and individuals who are deaf. To determine whether these varieties are historically related, this chapter presents a long-overdue comparative assessment of the sign lexicon used by North American Indians; it also compares North American Indian signs with lexical descriptions and illustrations of ASL from comparable historical periods. The study of lexical similarity can help us assess historical relatedness, and there are several important terminological and methodological considerations for the present work.

### Terminology and Methodology

Linguistic researchers who are concerned with the historical (i.e., diachronic) relationship between languages commonly carry out studies of lexical similarity. This approach is useful in determining whether language varieties share the same historical roots or can be traced to a common parent language or lineage. Historical linguistic researchers distinguish two main types of historical relatedness (cf. Campbell 2004; Parkhurst and Parkhurst 2003). First, genetically related languages have developed from a common ancestor and are classified as members of the same language family. A second type of historical relationship is lexical similarity due to language contact and lexical borrowing. In other words, two languages may have borrowed from each other over time, but their origins can be traced to two distinct original languages (cf. Campbell 2004).

The study of lexical similarity and cognates offers important insights into historical relatedness. As defined by Fromkin, Rodman, and Hyams (2007, 480) “*cognates* are words in related languages that developed from the same ancestral root, such as English *horn* and Latin *cornu*,” and, as they point out, “Cognates often, but not always, have the same meaning in different languages.” For example, “it is possible that at one time two words may have been historically very similar, but with the natural changes that occur over time the two words have evolved into forms that are so distinct as not to be easily recognizable” (Parkhurst and Parkhurst 2003, 1). Another example of this principle comes from Campbell (2004), who points out that the English word *eight* and the Spanish equivalent

*ocho* do not look or sound at all alike, yet both words can be traced to the Latin word *octo*. Monolingual English or Spanish speakers are unlikely to recognize that such words are historically related.

When comparing two languages to determine historical relatedness, one must take great care to sort out instances in which the lexical similarity between words may be coincidental rather than due to historical relatedness (Guerra Currie, Meier, and Walters 2002; Parkhurst and Parkhurst 2003). In comparing sign languages, Guerra Currie et al. (2002, 224) distinguish two historical causes of lexical similarity (i.e., a genetic relationship and lexical borrowing) and two factors that are non-historical (i.e., chance and shared symbolism). To illustrate this distinction between spoken languages, Parkhurst and Parkhurst (2003, 2) use the example of *madre* in Spanish and *mae* in Thai. Both words share the same meaning and appear to be similar lexically (a natural sound change could have deleted the intermediate consonants). In this case, the lexical similarity is based on *chance* or *coincidence* and not historical relatedness or lexical borrowing (Campbell 2004). This distinction “does not deny that the words for *mother* and *father* around the world tend to use those sounds first articulated by infants, nor does it deny that the reason for chance similarity in sign languages is primarily based on iconicity” (Parkhurst and Parkhurst (2003, 2).

Researchers in the field of historical linguistics recognize that these terms and distinctions may be difficult to define or apply in practice. According to Campbell (2000, 7), a *language family* “is a group of genetically related languages, ones that share a linguistic kinship by virtue of having developed from a common earlier ancestor.” The term *dialect* “means only a variety (regional or social) of a language mutually intelligible (however difficult this concept may be to define or apply in practice) with other dialects/varieties of the same language” (ibid.). Simply defined, *mutual intelligibility* means that speakers or signers of different dialects and varieties understand each other. Clearly these terms are far from unambiguous.

As Hoyer (2004, 7) points out, “one problem is that sometimes mutually intelligible varieties are defined as different languages for historical or political reasons.” For example, Swedish, Norwegian, and Danish are considered different languages, although they are generally mutually intelligible among native speakers. Conversely, in many instances, a speaker of a standard language does not understand a dialect of the same language (e.g., varieties of English spoken in the southern United States

or northern United Kingdom). Hoyer (ibid., 8) also cites other problems with the criterion of mutual intelligibility, such as the methods used to assess the degree of mutual understanding (via written or spoken language modalities), and reminds us “that these notions are not purely linguistic; they are also influenced by political and cultural factors.”

Campbell, Parkhurst and Parkhurst, and other researchers sometimes use the terms *historically related* and *genetically related* synonymously to mean *two languages that can be traced to the same parent language*. However, a review of the research literature indicates that there are two main types of historical relationship between languages: (1) genetic relatedness (i.e., coming from the same parent language), and (2) lexical similarity or relatedness due to borrowing (i.e., *historically* two languages may have borrowed from each other, but their origins can be traced to two distinct original languages). The study of lexical similarity is considered a major way to distinguish and elucidate these differences.

### **Methodologies Considered and Employed in the Present Study**

Several researchers have compared sign languages to determine whether they are historically related (e.g., Guerra Currie, Meier, and Walters 2002; Kyle and Woll 1985; McKee and Kennedy 2000; Parkhurst and Parkhurst 2003; West 1960; Woodward 1978). It is recognized that iconicity and indexicality features may potentially skew the results of lexical similarity studies of sign languages, and this is a major theoretical issue that signed language researchers continue to deal with in various ways. For example, to control for iconicity effects, some researchers use word lists with a lower potential for iconicity. In the research studies cited here, signed language researchers have proposed that a relatively high base level of lexical similarity — generally 80 percent — is necessary to determine that two lexical items can be considered to be cognates of genetically or historically related sign languages.

Woll, Sutton-Spence, and Elton (2001, 22) note that the following standards are generally applied to determine whether languages are separate languages or dialects of the same language: “If 80 percent or more of the words or signs are similar, then the variants are dialects of the same language. If 36 percent to 80 percent of the words or signs are similar, then the two languages belong to the same family. If the similarity is 12 percent to 35 percent, then the languages belong to families of the same stock. If it is under 12 percent then they are unrelated.”

However, when Kyle and Woll (1985) compared four European sign languages that they believed were not related to each other, they found that 40 percent of the signs in the four languages were quite similar or identical. Woll et al. (2001, 23) suggest that a higher level of lexical similarity between unrelated sign languages is “caused by the presence of visually motivated (iconic) signs in the languages which exhibited similarity independently of historical links” and that “this feature of sign language will always cause problems for the classification of sign languages, unless such examples can be factored out.”

Along similar lines, in a study to determine probable historical relatedness, Parkhurst and Parkhurst (2003) first compared four European sign languages that are not known to be related to each other (i.e., those of Spain, Northern Ireland, Finland, and Bulgaria); they then compared a second sample of sign language dialects from five major Spanish cities: Madrid, La Coruña, Granada, Valencia, and Barcelona. They found that comparing lexical items chosen for “low potential of iconicity” resulted in significantly lower similarity scores among unrelated languages than did word lists of basic vocabulary of “highly iconic signs.” Parkhurst and Parkhurst (ibid., 3) point out that “*iconic signs* look or act like the thing they represent,” thus skewing the results of cognate studies, but acknowledge that “the vast majority of signs in a sign language have some iconic reference.” They propose that cognate studies use word lists that comprise signs that are “low in iconicity.”<sup>8</sup> Considering the highly visual-gestural nature of sign language, sorting out the iconic from the noniconic may be a somewhat arbitrary or subjective endeavor, and overcompensating for potential visual symbolism might also skew the results. Woll et al. (2001) have also reported that the results of lexical similarity studies may be skewed by limiting the comparisons to small vocabulary lists of signs (e.g., fifty to one hundred items) and stress “the need to recognize that some dialects of different sign languages may be more similar to each other than other dialects” (23), thus the need to take language variation into account. Moreover, like other language phenomena, the feature of iconicity is perhaps best considered along a continuum.

Parkhurst and Parkhurst (2003) have proposed that a higher standard is needed to determine the number of cognates in historically related sign languages; they have also suggested that the thresholds may need to be raised an additional 5 to 10 percentage points (i.e., 91 percent similarity

indicates the same language) to account for the iconicity factor. They also state that such adjustments may not be necessary if lexical comparisons are limited to noniconic vocabulary. In other words, if highly iconic words are avoided, 81 to 90 percent similarity likely indicates that the languages are genetically and historically related. In their cognate studies of sign languages, Parkhurst and Parkhurst (2003) set the following thresholds:

0–40 percent similarity means separate languages

41–60 percent similarity means separate languages in the same family

61–70 percent similarity means inconclusive (likely to be different languages)

71–80 percent similarity means inconclusive (likely to be the same language)

81 percent similarity means they are the same language

Parkhurst and Parkhurst (12) use the “inconclusive” categories to indicate that the “similarity shows inconclusive results and other testing is necessary” to determine whether the sign languages in question are genetically related (i.e., the same language or different ones). That is, larger data sets should be studied. Again, a relatively high baseline is needed to determine the degree of similarity and is congruent with lexical similarity studies reported by the other signed language linguists cited throughout this section.

Due to the greater potential for shared symbolism (i.e., iconicity) among unrelated sign languages, other researchers (e.g., Guerra Currie, Meier, and Walters 2002, 233) have also suggested the need to follow a relatively high baseline level of similarity and cite Woll and Kyle’s (1985) 80 percent baseline. In their study of Mexican Sign Language (*la Lengua de Señas Mexicana*, or LSM), Guerra Currie et al. (*ibid.*) focused on LSM tokens that are proper nouns but did not exclude some signs that might be considered to have shared symbolism.<sup>9</sup> With this approach, signs that may be considered somewhat iconic are not excluded but are simply coded as having “shared symbolism.” See Guerra Currie et al. (2002), Parkhurst and Parkhurst (2003), Woll and Kyle (1985), and Woll et al. (2001) for more discussion of methods of comparing historically related and unrelated sign languages.

In short, the results of lexical similarity comparisons may be useful in assessing degrees of genetic relatedness; however, such scores alone are

not adequate to determine historical relatedness. Other major factors to consider include historical change, language contact, and lexical borrowing. A sizeable linguistic corpus is also needed to ensure greater accuracy of comparisons. Most lexical similarity studies of sign languages have used relatively small vocabulary lists (e.g., groups of fifty to two hundred words). The largest-known published study of lexical similarity to date (i.e., Guerra Currie et al. 2002) examined 915 sign tokens from Mexican Sign Language that generated 367 pairwise comparisons with three other sign languages (French Sign Language, Spanish Sign Language, and Japanese Sign Language). Guerra Currie et al. (ibid., 228) write that, “in analyzing only signs with approximately identical meanings and similar forms, we ultimately provide a conservative estimate of the strength and nature of similarities between the languages examined, especially those 38 percent lexical similarity between LSM and French Sign Language (with known historical contact and lexical borrowing) and 23 percent lexical similarity between LSM and Japanese Sign Language (with no known historical contact or lexical borrowing).

### **A Corpus of Lexical Descriptions**

The language corpus (more than 8,000 lexical descriptions and illustrations of American Indian signs) that is the focus of this chapter offers a unique opportunity to provide a linguistic assessment of the signed language varieties that were historically used by American Indian groups and Deaf communities (see also Davis 2006). The sources for the lexical descriptions used here are highlighted in Table 1. For the purpose of this study, 1,500 American Indian and ASL signs were examined:

- One thousand previously collected lexical descriptions and illustrations of American Indian signs from five time periods (1800s, 1820s, 1920s, 1930s, and 2000s) were examined; the comparison of American Indian signs from these five historical periods with ASL of the early 1900s generated 797 pairwise comparisons.
- Five hundred previously photographed ASL signs (Long 1918) were also examined and compared with contemporary ASL (2000) to establish a baseline of lexical similarity and historical relatedness.

Thus, the present study generated 1,297 pairwise comparisons of PISL and ASL from a sign vocabulary base of 1,500 items.

TABLE 1. Data Sources for the Lexical Comparisons

Sources	Date	Number of Lexical Descriptions	Format
Dunbar	1801	50	written
S. H. Long	1823	104	written
J. S. Long	1918	500	written and photographed
Tomkins	1926	500	written and illustrated
Sanderville	1934	200	filmed
Weatherwax	2002	150	filmed

It should be noted that Stephen H. Long and John S. Long are two different individuals from different historical periods and are not known to be related. Stephen H. Long (1823) provided one of the first compilations of written descriptions of Indian signs in the early nineteenth century, and John S. Long (1918) published the first dictionary of ASL with written descriptions and photographic illustrations in the early twentieth century.

### Standards

The following standards and procedures were adhered to in the present study:

- Signs in the language corpus with greater potential for lexical transparency (i.e., iconic or indexic) were not used for lexical comparisons (e.g., personal pronouns and numbers).
- Signs that were specific to the historical-cultural context during the time of the original documentation were also excluded (e.g., sign names for various Indian nations and the tools, weaponry, and animals that were hunted during the time period in which the descriptions were made, for example, bison, turkey, white tail deer, and dung fowl).
- The original lexical descriptions that are the focus of this study were collected from archival sources over a fifteen-year period (1990–2005). To ensure that the highest standards have been followed throughout the collection and digitization processes, I was assisted by archivists and researchers at the National Archives and the Smithsonian Institution and collaborated with fellow researchers (e.g., Sam Supalla and Melanie McKay-Cody).

- During subsequent stages of data collection, digitization, classification, verification, and translation (2002–2005), I was assisted by several deaf graduate and undergraduate students.
- In the process of selecting, digitally capturing, and coding the lexical descriptions (2004–2005), I was assisted by a deaf graduate student.
- A threshold of 80 percent similarity or greater between signs was used to determine whether the variants are dialects of the same language (i.e., genetically and historically related). This reflects the higher thresholds of similarity that are necessary when comparing sign languages.
- The standard followed is that, if less than 80 percent of the sign comparisons are similar or identical, then the two languages are considered separate (i.e., not genetically related).
- Lexical descriptions considered to be gestures have also been excluded in these comparisons; this determination is based on published criteria to distinguish gestures from signs (cf. McNeil 1992, 2000).<sup>10</sup>

### **Sample Illustrations and Summary of Coding Procedures**

The coding procedures followed in this study are based on similar criteria set forth by Guerra Currie et al. (2002, 227). Signs were coded as *similarly articulated* if they shared approximately the same meaning and differed according to only one major sign language parameter (e.g., handshape, movement, place of articulation). This designation also included signs that were articulated similarly or identically with regard to all three major parameters. Although signs coded as similarly articulated exhibited some differences in orientation, orientation was not considered a major formational parameter (cf. *ibid.*, 228).

Moreover, the use of photographs, illustrations, and written descriptions to compare sign languages entails certain limitations. However, these are the only data sources for lexical comparisons of nineteenth- and early twentieth-century sign languages. Digitized motion picture films from the 1930s obtained from archival sources (cf. Figure 4) were also considered in this study. The Sanderville and Weatherwax comparisons were based on filmed and videotaped lexical data.

Digitized samples of original pen-and-ink illustrations of Indian signs from the Garrick Mallery files (ca. 1880, MS 2372) in the National Anthropological Archives at the Smithsonian Institution illustrate the



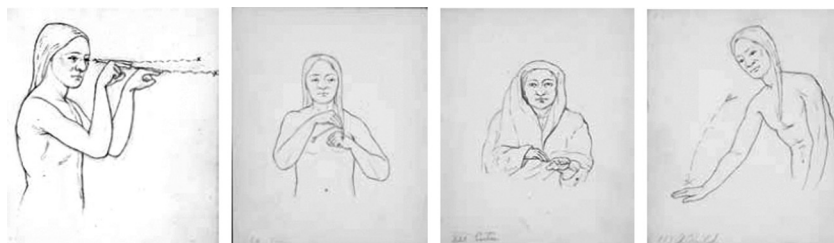


FIGURE 1 *Illustrations of PSL signs coded as similar to ASL. [SEE, ON, ENTER, CHILD]*<sup>1</sup>

conventionalized signs used by North American Indians and demonstrate how the coding procedures were applied in this study. To the best of my knowledge, the rare and fragile pen-and-ink illustrations shown in these figures have not been previously published. To help determine lexical similarity based on written descriptions, more than one written source was consulted and also compared with illustrated, photographed, and filmed sources. Figure 1 shows illustrations of Indian signs that were coded as similar to ASL.

#### SAMPLE WRITTEN DESCRIPTIONS

For the lexical comparisons in this study, written descriptions were also examined. For example:

SEE. “Bring right 2 hand to opposite eyes, and the two fingers should point in the direction one is looking” (Tomkins 1926, 51).

ENTERING (a house or lodge). “The left hand is held with the back upward, and the right hand also with the back up, is passed in a curvilinear direction, down under the other, so as to rub against its palm, then up on the other side of it. The left hand here represents the low door of the skin lodge, and the right, the man stooping down to pass in” (Long 1823, 158).

#### EXAMPLES OF SIGNS CODED AS LEXICALLY DIFFERENT FROM ASL

Indian signs that differed in more than one major parameter were considered to be distinct from ASL. Samples of these signs are presented in Figure 2.

1. Generally, arrows indicate the direction of movement; X marks the end point of articulation; and shaded handshapes show transitional movements (although this may vary somewhat between illustrations).

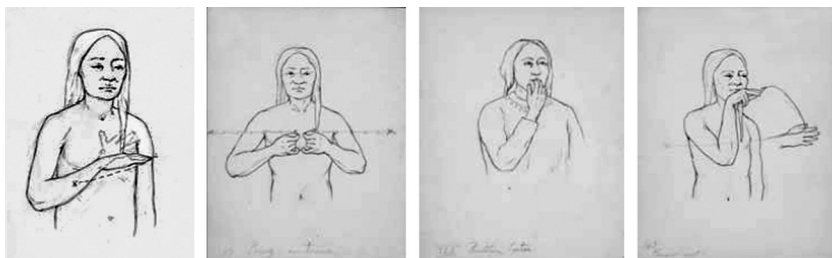


FIGURE 2 PSL signs coded as lexically different from ASL [GOOD, LONG-TIME, BROTHERSISTER, KNOW-NOT]<sup>2</sup>

The following written descriptions are examples of signs coded as lexically different:

Indian sign for GOOD: “Hold the flat right hand, back up, in front of and close to left breast, pointing to left; move hand briskly well out to front and right, keeping it in a horizontal plane” (Tomkins 1926, 31).

ASL sign for GOOD: “Place the end of the palm against the mouth; then bring it down against the open left hand so the back of the right hand rests on the palm of the left. In common use the latter part of the sign is omitted and the hand is simply thrown forward from the mouth” (Long 1918, 107).

Although GOOD is coded as lexically different (in location and movement), the PISL sign for GOOD is comparable to the two-handed ASL sign for NICE, CLEAN, PURE: “Place the right open hand upon the open left, crosswise and palm to palm, and letting the right hand rest near the ball of the thumb; pass the right hand along the length of the left” (ibid., 121).

In ASL, LONG-TIME is a compound sign: LONG: “placing the forefinger of the right ‘G’ hand lengthwise near the wrist of the extended left arm, draw it up the full length of the arm to the shoulder” (ibid., 109); TIME: “crook the forefinger of the right ‘G’ hand and with the tip end tap the back of the left ‘S’ hand” (ibid., 126). BROTHER and SISTER are also ASL compound signs (BOY + same and GIRL + same). In ASL, KNOW, which is “tap the forehead with the end of the hand” (ibid., 56), can be negated (NOT-KNOW) if the sign is produced with a movement toward, then away from the forehead.

2. Note the similarity between the sign glossed GOOD and the ASL sign for NICE (although these were coded as different); KNOW-NOT could also be glossed as SPEAK-NOT.

The Indian sign for KNOW-NOT in Figure 2 is a compound sign (SPEAK + NOT). The Indian sign for KNOW is more commonly described as “hold right hand, back up, close to breast; sweep hand outwards and slightly upwards, turning hand by wrist action until palm nearly up; thumb and index extended, other fingers closed, thumb and index horizontal, index pointing nearly to left, thumb pointing to front” (Tomkins 1926, 37). These examples demonstrate the issue of following written lexical descriptions alone from a single source. In this study, illustrations, photographs, and films from multiple sources were used to make lexical comparisons.

### **Description of Historical Sources for the Lexical Comparisons**

I first examined 50 descriptions of Indian signs originally published by William Dunbar (1801) and 104 Indian sign descriptions from Stephen H. Long’s (1823) account of an official expedition to the Rocky Mountains. Subsequent to their original printings, both previously published historical accounts (Dunbar and Long) were reprinted collectively (with the omission of approximately ten descriptions that the editor considered redundant) as the “Indian Language of Signs” in the *American Annals of the Deaf and Dumb* (Gallaudet 1852). These historical publications present descriptions of the signs reportedly used by American Indian groups of the early 1800s. They also provide discussion of some similarities with the signs used by deaf people of that historical period. In the present study, lexical comparisons are made between descriptions and illustrations of signed language varieties reportedly used by deaf people of several different historical periods (1800s–2000). Table 1 lists the lexical descriptions and data sources used in this study.

The earliest known descriptions and illustrations of signs used by American Indians were made in the early 1800s, during the first official expeditions to the western territories of what is now the United States. They formed the basis of a paper titled “Sign Language of the Indian Nations to the West of the Mississippi River,” which was presented by Thomas Jefferson, president of the American Philosophical Society (Dunbar 1801). Descriptions were given for more than fifty signs used by members of the Indian nations. Jefferson made this presentation in January 1801, one month prior to his presidential inaugural address. The title and content of his lecture reflect the fact that Jefferson had an enthusiastic interest in the subject and realized the relevance of the sign language used by the Indian nations. Although previously published in the

1800s, the address has long been out of print. The original copy of Dunbar's (1801) paper and original pen-and-ink drawings are from the Garrick Mallery files in the National Anthropological Archives at the Smithsonian Institution (ca. 1880, MS 2372).

### **The Natural Language of Signs**

The next official U.S. expedition following that by Lewis and Clark was led in 1819 by Maj. Stephen H. Long of Pittsburgh, Pennsylvania, and went as far as the Rocky Mountains (Davis 2005, 2006). The vital communication role that Indian Sign Language played is described in the published account of the expedition (Long 1823, 378–94), which included more than one hundred descriptions of Indian signs. Thomas H. Gallaudet, cofounder of the first school for deaf students in the United States in 1817, used these early descriptive accounts of Indian signs to make a case for “the Natural Language of Signs” for teaching and communicating with people who are deaf.

Gallaudet's first published papers advocated the use of the natural language of signs to teach children who were deaf. In 1848, he published an essay that included detailed descriptions of some of the signs used by the “aboriginal Indians” taken from Long's (1823) account. It is clear from his writings that Gallaudet considered Indian Sign Language, like the sign language of deaf people, to be a natural occurrence. Historical records indicate that frequent contact occurred between signing Native American and deaf groups (Mallery 1880; McKay-Cody 1997). Gallaudet's attention to Indian Sign Language in these early publications and the dissemination of descriptions of Indian signs to educators of deaf people through the *American Annals for the Deaf and Dumb* (1823–1890, vols. 1–35) make it plausible that during this period American Indian signs were introduced to people who were deaf. However, such claims remain speculative at this point. See Nover (2000) for more discussion of nineteenth-century authors (e.g., Fay 1874, 1890; Rae 1852; Tylor 1878; Mallery 1882) who provided detailed descriptions and comparisons of ASL signs and the “Indian Language of Signs.”

### **Early Descriptions of American Sign Language**

In 1910, J. Schuyler Long, long-time principal at the Iowa School for the Deaf, published one of the earliest-known compilations of ASL lexical descriptions, which also included 500 photographic illustrations. Long's “manual of signs” was first published in its entirety in 1910 and

included 1,063 *root signs*; in 1918, after Long's death, it was republished by Gallaudet College. By 1963, his work, titled *The Sign Language: A Manual of Signs* (and subtitled *Being a descriptive vocabulary of signs used by the Deaf of the United States and Canada*), had been reprinted nine times.

Reference to Indian Sign Language is noticeably absent from J. S. Long's manual. However, it is known that he corresponded with both Mallery and Scott, the preeminent scholars of Indian Sign Language of the time. Long and Scott apparently held very different perspectives on sign language, as is evident from an article reprinted in the *Kentucky Standard* (ca. 1930) that had originally appeared in the *Iowa Hawkeye*. In this newspaper article, Hugh Scott (ca. 1930, 4) proposed that Indian Sign Language be used as a form of *international communication*. Scott described its role: "Before the coming of the white man, [it served as] the arbiter between peace and war and the means of spreading intertribal culture." He also wrote that Indian Sign Language was "subject to all the general laws of linguistic science save those of sound and differs from vocal speech mainly in that it makes appeal to the human brain through the eye rather than the ear" (ibid.). In the 1930 *Kentucky Standard* newspaper article, Scott responded to J. S. Long: "You know we have invented some 300 artificial languages like Esperanto etc., for international communication, not one of which has been successful because the people will not use them."

Hugh Scott was one of the progenitors of PISL as learned internationally by the Boy Scouts. Long sent Scott a copy of his *Sign Language* (1910) and wrote to convince him of the "value of the sign language of the deaf as a universal language." Scott believed that the sign language of deaf people would not capture the interest of the Boy Scouts as would the sign language of the Indians. Concerning this, J. S. Long listed several "disadvantages of the Indian sign language as compared with that of the deaf":

Romantic interest evidently blinds the judgment in this case. How the language of a primitive of civilization can become a universal language is hard to understand. Science, literature, commerce and religion are all foreign to the Indian's experience. What signs can he have to express the thoughts of a cultivated people in connection with them? As a universal language the Indian signs may serve the boy minds of scouts, but as a universal language it will go the way of

Esperanto and its kind [reprinted from the *Iowa Hawkeye* in the *Kentucky Standard* (4, ca. 1930).

Clearly, Scott and Long held vastly different positions on this subject. Central to these differences were issues of language status, universality, and the iconicity of sign language. They were men of their times, and their writings reflect certain biases. Scott believed that others would not be interested in learning the sign language of deaf people. Long advocated that the sign language of those who are deaf was superior to the alternate sign language of the American Indians, a language he considered to be the consequence of a “primitive civilization.”

RESULTS

Establishing a Baseline of Lexical Similarity for Historical Relatedness

The focus of this chapter is not a diachronic study of ASL; however, John S. Long’s (1918) *Sign Language* is a useful starting point for making lexical comparisons with the earliest-known descriptions of Indian sign lexicon (i.e., Dunbar 1801; Stephen Long 1823). Comprising 1,000 written descriptions and 500 photographs of ASL signs, J. S. Long’s easily accessible *Sign Language* is the earliest-known such compilation. In order to establish a baseline of lexical similarity, I first compared his photographs and descriptions with contemporary ASL. Following the coding procedures and criteria established for this study, I was able to code 465 of the 500 photographs and descriptions (93 percent) as similar or identical to contemporary ASL signs. These results are summarized in Table 2.

Ninety-three percent is a very high rate of lexical similarity and is congruent with lexical comparisons of the same language (i.e., historically and genetically related). Frishberg (1975) and Woodward (1978), among

TABLE 2. Summary of Similarly Articulated Signs for ASL (Long 1918) and Contemporary ASL

Pairwise Comparison	Total Sign Pairs	Similarly Articulated Signs and Similarity Percentages
ASL (Long 1918) compared with contemporary ASL	500	465 (93 percent)

others, have described language-internal historical change in ASL. The comparison of lexical similarity presented in Table 2 also takes into account historical changes that have occurred in ASL (cf. Valli and Lucas 2000, 170–72).

Historically, some two-handed ASL signs have become one-handed signs and vice versa. The following examples of historical change appear in J. S. Long (1918). In that work, FATHER and MOTHER are described and photographed as two-handed signs: “With the fingers closed and thumb extended, place thumb at the right side of the forehead [at the right cheek for MOTHER] and at right angles to it; with a slightly twisting motion, bring hand away, opening fingers and turning palm upward; at the same time bring the left hand up similarly and place parallel to the right as if lifting up a babe” (ibid., 36–37). Assimilation (i.e., over time, the handshape of one hand comes to resemble that of another) is also evident in the data (e.g., the dominant hand becomes the same as the passive hand in SON, DAUGHTER, BROTHER, SISTER, HUSBAND, WIFE, and HOPE).

Changes in the location of a sign also commonly occur over time (e.g., for HOME, the initial place of articulation has shifted from the mouth to the cheek; DON’T CARE was formerly articulated at the forehead instead of the nose; HONOR is now produced in the neutral space in front of the body instead of at the forehead; for PICTURE, the initial contact is in front of the face instead of at the side of the face).

### **Comparisons of the Earliest Indian Sign Descriptions and ASL**

Next I examined the earliest-known descriptions of Indian signs from Dunbar (1801) and Long (1823), which were also compiled into one list and published as the “Indian Language of Signs” in the *American Annals of the Deaf and Dumb* (Gallaudet 1852). The combined descriptions from Dunbar and Long covered 154 different signs. After the exclusion of the signs mentioned in the methodology section, eighty-five different sign pairs were available for comparison. Of the fifty-three sign pairs from S. Long’s (1823) descriptions, twenty-nine (55 percent) were coded as similar or identical to ASL. Of the thirty-two from Dunbar (1801), twelve (38 percent) were coded as similar or identical to ASL. Taken together, the Indian and ASL signs showed a similarity of 48 percent (41 out of 85). The results of these pairwise comparisons are summarized in Table 3.

The percentages of similarity in these pairwise comparisons indicate separate languages (i.e., unlikely to be genetically related). However,

TABLE 3. Summary of Similarly Articulated Signs between the Dunbar/Long Corpus and ASL

Pairwise Comparison	Total Sign Pairs	Similarly Articulated Signs and Similarity Percentages
S. Long (1823) corpus compared with ASL (J. Long 1918)	53	29 (55 percent)
Dunbar (1801) corpus compared with ASL (J. Long 1918)	32	12 (38 percent)
S. Long (1823); Dunbar (1801); ASL (1918)	85	41 (48 percent)

55 percent is a relatively high degree of lexical similarity and suggests possible contact and borrowing between the languages (cf. Parkhurst and Parkhurst 2003 12; Woll et al. 2001, 22). Because the 170 comparisons in Table 3 represent a small language sample, more sign-pair comparisons are needed before firmer conclusions can be drawn. Based on the historical evidence, however, it is highly probable that lexical borrowing occurred as a consequence of language contact between native groups of American Indians and individuals who were deaf, especially in view of the fact that, during this period, the original descriptions of Indian signs were distributed to educators of deaf people around the country through the *American Annals of the Deaf* (1848, vol. 1, through 1890, vol. 35). The illustrations in Figure 3 (ALIKE, YES, EXCHANGE, SUN) are examples of PISL signs that are lexically similar to ASL signs.

As the original pen-and-ink illustrations in Figure 3 show, certain Indian signs are lexically similar to ASL, such as ALIKE (also used to mean “married”), YES (also used to indicate ‘truth’), and EXCHANGE. The Indian sign for “sun” is comparable to ASL SUNRISE/SUNSET and OVERSLEEP. The following written descriptions are from Dunbar (1801) and S. Long (1823):

- “SAME or SIMILAR (to what went before) — Place the two fore fingers parallel to each other and push them forward a little” (Dunbar 1801, 1).
- “TRUTH — The fore finger passed, in the attitude of pointing, from the mouth forward in a line curving a little upward, the other fingers being carefully closed;” and “LIE — The fore finger and middle fingers extended, passed two or three times from the mouth forward: they are



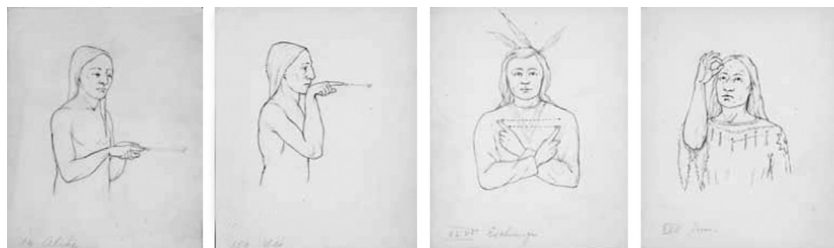


FIGURE 3 *Additional PSL signs lexically similar to ASL signs* [ALIKE, YES, EXCHANGE, SUN]

joined at the mouth, but separate as they depart from it, indicating that the words go in different directions” (S. Long 1823, 160).

“SUN — The fore finger and thumb are brought together at [the] tips, so as to form a circle, and held up toward the sun’s track. To indicate any particular time of the day, the hand with the sign of the sun, is stretched out toward the east horizon, and then gradually elevated, to show the ascent of that luminary, until the hand arrives in the proper directions, to indicate the part of the heaven in which the sun will be at the given time” (ibid., 157).

“EXCHANGE — The two fore fingers are extended perpendicularly, and the hands are then passed by each other transversely in front of the breast, so as nearly to exchange positions” (ibid., 160).

#### COMPARISON OF WRITTEN DESCRIPTIONS OF LEXICALLY SIMILAR SIGNS

Indian sign: “NOW (or at present) — The two hands forming each a hollow and brought near each other and put into a tremulous motion upwards and downwards” (Dunbar 1801, 7).

ASL sign: “NOW, PRESENT — Place the open hands pointing outward, palms up, in front, about the waist line; drop them a little and rather quickly” (J. Long 1918, 129).

Indian sign: “DONE, FINISHED — The hands placed edge up and down parallel to each other, the right hand without, which later is drawn back as cutting something” (Dunbar 1801, 8).

ASL sign: “COMPLETE, FINISH (bring an end to anything) — Place right ‘B’ hand with lower edge at right angles across the top edge of left ‘B’

near the wrist; push it along the edge of the hand till it reaches the end, then ‘chop’ it off” (J. Long 1918, 92).

**PISL/ASL Comparisons of Early Twentieth-Century Descriptions**

William Tomkins (1926) published a dictionary titled *Universal Indian Sign Language of the Plains Indians of North America* with more than five hundred illustrations. This publication had nine editions and was widely used by the Boy Scouts International as a “universal” means of communication. Despite the questionable use of the term “universal,” the renowned anthropological linguist Albert Kroeber (1958) considered Tomkins’s dictionary to be a very reliable source for Indian Sign Language.

In the late 1800s, Tomkins grew up “on the edge of the Sioux Indian Reservation in Dakota Territory,” where he first learned sign language as a boy (1926, 7). He studied the published works of Mallery (1880, 1881) and Clark (1880) and maintained his studies of Indian Sign Language through frequent interaction with Blackfoot, Cheyenne, and Arapahoe signers. His primary informant was J. L. Clark, a Blackfoot Indian sculptor from Glacier Park, Montana, who was deaf.<sup>11</sup>

For the present study, I made 306 sign pair comparisons between ASL and the PISL descriptions and illustrations from Tomkins (1926). Of these, 150 of 306 (49 percent) Indian signs were coded as similar or identical to ASL. This is consistent with the pairwise comparisons made between earlier descriptions of Indian signs (Dunbar 1801; S. Long 1823) and ASL, in which 48 percent similarity was evident (see Table 3). According to the standards of historical linguistics and the thresholds of lexical similarity (discussed in the literature section), this percentage of similarity indicates separate languages. The relatively high percentage of similarity (49 percent) warrants further investigation and suggests that language contact and lexical borrowing took place between ASL and PISL. These results are presented in Table 4.

TABLE 4. Summary of Similarly Articulated Signs for PISL/ASL Lexical Comparisons

Pairwise Comparison	Total Sign Pairs	Similarly Articulated Signs and Similarity Percentages
PISL (Tomkins 1926) ASL (J. Long 1918)	306	150 (49 percent)

**LEXICAL COMPARISONS FOR DUNBAR/LONG (EARLY 1800s)  
AND TOMKINS (EARLY 1900s)**

When I compared the Dunbar (1801) and Long (1823) descriptions with Tomkins’s (1926) descriptions and illustrations, the percentage of similarity was higher. This time fifty-two of sixty-one (85 percent) descriptions from Long and twenty-two of twenty-seven (81 percent) from Dunbar were similar or identical to those by Tomkins. The combined total indicates that, between Long-Dunbar and Tomkins, seventy-four of eighty-eight (84 percent) sign pairs were similar. Following the standards described earlier, these findings suggest that the sign varieties represented in this sample, with a historical range from 1801 to 1926 (125 years), appear to be genetically related (i.e., from the same language origins). These results are summarized in Table 5.

**Indian Sign Language Film Dictionary (1930s)**

The motion pictures that were produced by Hugh Scott (with support from a 1930 Act of the U.S. Congress) constitute one of the richest sources of PISL data. These films documented chieftains and elders from thirteen distinct spoken language groups who were communicating with each other through sign language. During the historic three-day Indian Sign Language Council (September 4–6, 1930), several discussions were signed, including the telling of anecdotes and stories. These documentary films show the Indian participants engaging in several types of discourse (e.g., making introductions and showing name signs for each of the tribes represented; signing traditional cultural and medicine stories; making metaphorical comparisons; see Davis 2006).

TABLE 5. Summary of Similarly Articulated Signs for the Dunbar/Long-Tomkins Sign Pairs

Pairwise Comparison	Total Sign Pairs	Similarly Articulated Signs and Similarity Percentages
S. Long (1823) and Tomkins (1926)	61	52 (85 percent)
Dunbar (1801) and Tomkins (1926)	27	22 (81 percent)
Dunbar/Long and Tomkins	88	74 (84 percent)

One of Scott’s primary consultants was Richard Sanderville, a Blackfeet tribal elder and interpreter. In 1934, Sanderville traveled to the Smithsonian Institution in Washington, D.C., to complete the Indian Sign Language film dictionary started by Scott, who died before finishing the project. Scott’s contribution (i.e., 358 proper noun signs for tribes and geographic locations) were included with the 1930s’ films. While working at the National Archives in 2002, I located Sanderville’s contribution to Scott’s “dictionary,” which was filmed at the Smithsonian in 1934. Unfortunately, the only preservation copies available were either poorly processed or produced in an outmoded format. After three years of analysis to decipher what remains of Sanderville’s film contribution, I examined approximately 347 signs and idioms in a variety of lexical categories including abstract nouns, classifier predicates, and noun and verb modifiers. Some PISL sign examples from Sanderville are the following:

SPOTTED	FAMOUS
HORSE DISMOUNT	FEW
LAKE (WATER ROUND)	QUARRELSOME
GALAXY/MILKY WAY	TRADITIONAL
GLAD	WANT
ANXIOUS	CHOLERA
BEAUTIFUL	

Along with Sanderville’s original translations, examples of what he called “idioms” are the following:

Signed Expression	Sanderville’s Translation
BREAK MY TALK	disobey
GRASS CUT THREE TIMES	alfalfa
PRAIRIE THINK	believe without cause
PRAIRIE KILLING	accidental killing
PRAIRIE DO TO ME	not my fault
TINY BIT RECOVER	saved by the skin of one’s teeth
TO CARRY OR HAVE A PIPE	to be a leader
PUT BLANKET OVER THE HEAD	to suppress
SOLDIER DO IT	to effect tribal decision
HIDE TALK	whisper

## COMPARISONS OF SANDERVILLE AND WEATHERWAX

Sanderville's (1934) contribution may be considered a type of Rosetta stone. That is, the lexical inventories documented in these films, combined with the basic written and voice-over translations provided by Sanderville and Scott (1931–1934), are the keys to deciphering what the original participants at the council were signing. Figure 4 provides digitized movie stills from the 1930s' Council of Indian Sign Language. In that figure, Short Face of the Piegan tribal group signs NOW to mark his turn to sign. Bitter Root Jim, representing the Flathead (Salashian) people, uses the tribal sign PIEGAN, the sign for SAME-AS, and the traditional sign for INDIAN.

In the next analysis I compared Tomkins's early twentieth-century descriptions with 150 examples of Indian signs that were contemporarily signed and videotaped in 2002 by Martin Weatherwax, chair of Blackfeet Studies at Blackfeet Community College in Browning, Montana (near the original site of the 1930s' Indian Sign Language Council). Weatherwax (pers. comm., May 2002) reported that he learned Indian Sign Language natively from his Blackfoot grandfather.

The comparisons of sign tokens from the Sanderville-Weatherwax corpus involved the following. First, in the Sanderville-Tomkins comparison of 100 pairs, 90 percent were coded as similarly articulated. Second, the comparison of eighty sign pairs between Weatherwax and Tomkins showed that sixty-four pairs (80 percent) were similarly articulated. Third, the comparison of fifty sign pairs between Weatherwax and Sanderville revealed that 92 percent were similarly articulated. Table 6 summarizes these results.

Nevertheless, 230 sign pairs constitute a relatively small sample, and additional pairwise comparisons are needed before definitive conclusions



FIGURE 4 Movie stills from 1930s Council of Indian Sign Language [NOW, PIEGAN, SAMEAS, INDIAN] (Source: Scott 1934, Courtesy of the National Archives, Washington, DC)

TABLE 6. Summary of Similarly Articulated Signs for the Sanderville-Tomkins-Weatherwax Lexical Comparisons

Pairwise Comparison	Total Sign Pairs	Similarly Articulated Signs and Similarity Percentages
Sanderville-Tomkins	100	90 (90 percent)
Weatherwax-Tomkins	80	64 (80 percent)
Sanderville-Weatherwax	50	46 (92 percent)

can be reached. Still, these preliminary findings (a 90–92 percent range of similarity between Sanderville and Tomkins and between Sanderville and Weatherwax, respectively) is a strong indication that the PISL sign varieties used by Sanderville, Tomkins, and Weatherwax are genetically and historically related. Tomkins had reportedly been signing since 1884, and the descriptions and illustrations used in those sign-pair comparisons were compiled in the early 1920s. Sanderville had been signing all of his life and was filmed in 1934, when he was in his late seventies. Weatherwax, who was filmed in 2002, had also been signing his entire life (having learned it from his Blackfoot grandfather in the early 1950s). Thus, these sign models had been signing throughout their lives, and these data thus span a 200-year time period, from the nineteenth to the early twenty-first century.

**SUMMARY AND CONCLUSIONS**

The PISL corpus considered for this study was collected from several generations of signers (i.e., from the early 1800s to the early 2000s). More than 8,000 descriptions of Indian signs were identified from previously collected written, illustrated, and filmed sources (Davis 2006). Given the richness and potential number of comparisons offered by this corpus, there is an evident need for expanded historical (diachronic) and contemporary (synchronic) comparative analyses of language change, shared symbolism, lexical borrowing, and historical relatedness among these signed language varieties. For the present study, 1,500 lexical signs were selected from the sources mentioned. This resulted in 1,297 pairwise comparisons between PISL and ASL historical antecedents. The analyses of the admittedly small data sets led to several conclusions.

Due to the greater potential for shared symbolism (i.e., iconicity) among unrelated sign languages, researchers (cf. Guerra Currie et al.

2002; Parkhurst and Parkhurst 2003; Woll et al. 2001) have proposed that a relatively high baseline of percentage of lexical similarity is needed to determine whether sign languages are historically related. While researchers vary to some degree in the standard or method applied to determine lexical similarity and historical relatedness, they generally agree that a base level of at least 80 percent similarity is needed to determine whether two sign languages are historically or genetically related. Because iconicity and indexicality features may potentially skew the results of lexical similarity studies of sign languages, signed language researchers continue to deal with this major theoretical issue in various ways (e.g., establishing high thresholds to determine lexical similarity and using word lists with a low potential for iconicity).

The present study has followed the methods and standards established in previous lexical similarity and cognate studies; two main causes of historical relatedness have been considered: genetic and lexical borrowing as a result of language contact. Genetically related languages develop from a common ancestor and are classified as members of the same language family (cf. Campbell 2000, 2004). Lexical similarity or relatedness may also be caused by historical language contact and borrowing (i.e., two languages may have borrowed from each other over time, but their origins can be traced to two distinct original languages). The 80–90 percent range of lexical similarity among the PISL sign varieties compared in this study indicates that these varieties were dialects of the same language. These findings are congruent with West's (1960) earlier findings that PISL of the North Central Plains area was the standard dialect and that different dialects of PISL were used by Native American groups beyond this geographic area. Although the best-documented cases are of the PISL variety used among the more nomadic groups of the Great Plains region, different sign varieties have been observed among the tribes of northwestern Canada and the southwestern region of the United States (see Davis 2006). Further studies are needed to clarify the similarities and differences between these signed language varieties.

The percentages of lexical similarity (in the 50-percent range) in the pairwise comparisons between historical varieties of ASL and PISL indicate that they are separate languages (i.e., unlikely to be genetically related). However, this is a relatively high range of lexical similarity and indicates possible lexical borrowing between the languages. Based on this evidence, it is highly probable that lexical borrowing occurred as a

consequence of language contact between native groups of American Indians and individuals who were deaf. Supporting this conclusion is the fact that, during the eighteenth and early nineteenth centuries, the original descriptions of Indian signs were published and distributed to educators at schools for deaf children around the country; moreover, there are also several historical accounts of American Indians visiting residential schools for deaf students during the nineteenth century (e.g., Mallery 1880). I maintain that a need exists for additional studies of larger data sets and of historical sign language contact between individuals from the American Indian and the Deaf communities.

The historical analysis of lexical similarity discussed here offers a relatively limited picture of the numerous sociolinguistic factors at the interface of language and culture. Nonetheless, as signed language researchers employ new and better methods of data collection and analysis, particularly in the fields of sociolinguistics and historical linguistics, the accuracy of cross-linguistic sign language studies will be enhanced and provide a better picture of the relationship between signed languages. Further research of naturally occurring discourse that characterizes other linguistic levels (e.g., the phonological to the grammatical) is also needed. I hope that the preliminary findings reported here will inform future studies of historical and contemporary sign language use among North American Indians and encourage additional language revitalization, preservation, data collection, descriptions, and ethnographic fieldwork.

## NOTES

1. Various terms are used in the literature to refer to the aboriginal peoples of the Americas. Members of these cultural groups generally call themselves Indians. The term “North American Indian” is sometimes necessary to distinguish the indigenous peoples of North America from those of Central and South America. Specific tribal affiliations and cultural-linguistic groups are acknowledged whenever possible (e.g., Assiniboine, Blackfeet, Lakota, Northern Cheyenne; cf. Campbell 2000; Davis 2006; Mithun 1999).

2. I offer readers a link to a prototype online digital archive of documentary materials and continue to expand this open-access online linguistic corpus to include translations, linguistic analyses, and descriptions. Readers may view samples of the historical documentary films and illustrations documenting tradi-



tional signed language used by some Indian groups at the following website: <http://sunsite.utk.edu/plainssignlanguage/>. The development and maintenance of this archive is supported by a 2006–2007 fellowship for Documenting Endangered Languages from the National Endowment of the Humanities and National Science Foundation, with the endorsement of the Smithsonian Institution and support from the University of Tennessee’s Digital Library, Office of the Chancellor and Dean of Graduate Studies.

3. Linguistic families are capitalized and the “equals” sign (=) indicates dialects of the same language (Campbell 2000; Mithun 1999).

4. Generally, twelve major geographic cultural areas of Native North America have been identified in the literature, with the Plains cultural area centrally located to all of these. Waldman (2000 32–33) explains that these cultural areas were “not finite and absolute boundaries” and “that tribal territories were often vague and changing, with great movement among the tribes and the passing of cultural traits from one area to the next; and that people of the same language family sometimes lived in different cultural areas, even in some instances at opposite ends of the continent.”

5. Wurtzburg and Campbell (1995, 154–55) report that the earliest-known descriptions of the Indians signing come from the 1527 Spanish expedition to Florida and were written by Álvaro Núñez Cabeza de Vaca, who described numerous occasions during which Indian groups communicated with each other in signs. According to the historical record, Cabeza de Vaca “also clearly distinguished which groups spoke the same language, which spoke different languages but understood others, and which groups did not understand others at all, except through the use of sign language” (ibid., 155). Pedro de Castañeda made similar descriptions during the Coronado expedition of 1541–1542, and subsequent reports continued into the eighteenth century (see Wurtzburg and Campbell 1995 for further descriptions).

6. It is noteworthy that Franz Boas and Garrick Mallery helped establish and served terms as presidents of learned societies during the late 1800s and early 1900s (e.g., the Linguistic Society of America, the American Philosophical Society, and the American Anthropological Society). Mallery was credited as one of the first scholars of his time to use the term “semiotics” (Umiker-Sebeok and Sebeok 1978). During the mid-1900s Albert Kroeber and Charles Voegelin each also served terms as president of the Linguistic Society of America and were considered pioneers in the emergent field of anthropological linguistics; the two developed the most widely used classification systems for Native American languages that are still in use today.

7. Since West’s two-volume dissertation, there has been only one published linguistic analysis of American Indian Sign Language (i.e., Newell’s analyses of morphosyntactic structures, which supported Kroeber’s [1958] earlier observation

that, “whereas writing systems such as Chinese or Hieroglyphics are alternate expression systems of a single communication system, sign language is an independent communication system in its own right” [1981, 1989]).

8. Parkhurst and Parkhurst (2003) recommend using sign vocabulary lists that comprise primarily common nouns (e.g., family members, animals, foods, clothing), wh-questions (who, what, where, how), calendar terms (days of the week, months, year), basic color terms (white, black, blue, green), and a limited number of adjectives (poor, sweet, young, dirty, afraid) and verbs (to begin, to lie, to play). They provide a single example of a highly iconic sign (BOOK) and do not describe the process of elimination for highly iconic vocabulary from the “Parkhurst word lists” (their term for their basic 50-word short lists and 100-word long lists).

9. For example, Guerra Currie, Meier, and Walters (2002) compared sign pairs between Mexican Sign Language (la Lengua de Señas Mexicana, or LSM) and Japanese Sign Language (Nihon Syuwa, or NS) that share no known historical or cultural links and found that 23 percent of the signs compared were similarly articulated. As Guerra Currie et al (2002, 229) describe this, “the forms of these signs appear to be drawing from similar imagistic sources, such as shared visual icons in such sign pairs as FIRE, BIRD, and HOUSE.” Such visual imagery is reflected in the signs for the fire’s “flame”; bird’s “beak”; and house’s “roof.”

10. McNeill (1992, 6) identified four types of gestures that should be considered along a continuum of “gesticulation,” “pantomime,” “emblem,” and “sign language.” McNeill (2000, 6) has proposed that “*gesticulation* accompanies speech” and “is non-conventionalized” and distinguished this from the *signs* in a signed language that, “like words in speech, are conventionalized, segmented, and analytic, and possessed of language properties, while they are obligatorily not performed with speech.” McNeill correlated the presence or absence of speech with gesture and with the absence or presence of conventional linguistic properties and concluded that “*emblems* are at an intermediate position . . . partly like gesticulations, partly like signs.” McNeill (1992, 6) emphasized “the *nonlinguistic* character of these gestures: the lack of a fully contrastive system and the lack of syntactic potential.”

11. Tomkins (1926, 9) claimed that “every sign in this work is a true Indian sign. . . . Nothing has been borrowed from the deaf or from other sources.” That is, he did not include the ASL signs of schools for deaf children or the Deaf community. Although his primary consultant was a deaf Blackfoot, it was common during this time period for American Indians who were deaf to remain on the ancestral lands or Indian reservations with little or no contact with ASL-signing Anglo Deaf community members. Following traditional ways, it was common for some deaf American Indians not to attend state residential schools for deaf children (see Davis and Supalla 1995 for further descriptions).

## REFERENCES

- Battison, R. 1978/2003. *Lexical borrowing in American Sign Language*. Silver Spring, Md.: Linstok.
- Baynton, D. 2002. The curious death of sign language studies in the nineteenth century. In *The study of signed languages: Essays in honor of William C. Stokoe*, ed. D. Armstrong, M. A. Karchmer, and J. V. Van Cleve, 13–34. Washington, D.C.: Gallaudet University Press.
- Boas, F. 1890/1978. Sign language. In *Aboriginal sign language of the Americas and Australia*. Vol. 2, ed. D. J. Umiker-Sebeok and T. A. Sebeok, 19–20. New York: Plenum. Reprinted from the *Report of the sixtieth meeting of the British Association for the Advancement of Science* (1890), 638–41. London: John Murray.
- Campbell, L. 2000. *American Indian languages*. New York: Oxford University Press.
- . 2004. *Historical linguistics: An introduction*, 2<sup>nd</sup> edition. Cambridge: MIT Press.
- Clark, W. P. 1885. *The Indian sign language*. Philadelphia: Hamersly.
- Crystal, D. 2000. *Language death*. New York: Cambridge University Press.
- Davis, J. E. 2005. Evidence of a historical signed lingua franca among North American Indians. *Deaf Worlds* 21(3): 47–72.
- . 2006. A historical linguistic account of sign language among North American Indian groups. In *Multilingualism and sign languages*, ed. C. Lucas, 3–35. Sociolinguistics of the Deaf Community series, vol. 12, Washington, D.C.: Gallaudet University Press.
- Davis, J. E., and S. Supalla. 1995. A sociolinguistic description of sign language use in a Navajo family. In *Sociolinguistics in Deaf communities*, ed. C. Lucas, 77–106. Sociolinguistics of the Deaf Community series, vol. 1. Washington, D.C.: Gallaudet University Press.
- Dunbar, W. 1801. On the Language of Signs among certain North American Indians. *Transactions of the American Philosophical Society*, 6 (1): 1–8.
- Farnell, B. M. 1995. *Do you see what I mean? Plains Indian sign talk and the embodiment of action*. Austin: University of Texas Press.
- Frishberg, N. 1975. Arbitrariness and iconicity: Historical change in American Sign Language. *Language* 51, 696–719.
- Fromkin, V., R. Rodman, and N. Hyams. 2007. *An introduction to language*, 8th ed. Boston: Thomson Wordsworth.
- Gallaudet, T. H. 1848. On the natural language of signs; and its value and uses in the instruction of the deaf and dumb. *American Annals of the Deaf and Dumb* 1: 55–60.
- . 1852. Indian language of signs. *American Annals of the Deaf and Dumb* 4: 157–71.

- Goddard, I. 1979. The languages of South Texas and the lower Rio Grande. In *The languages of native America: Historical and comparative assessment*, ed. L. Campbell and M. Mithun, 70–132. Austin: University of Texas Press.
- Gordon, R. G., Jr., ed. 2005. *Ethnologue: Languages of the world*, 15th ed. Dallas: SIL International. <http://www.ethnologue.com/>.
- Groce, N. E. 1985. *Everyone here spoke sign language: Hereditary deafness on Martha's Vineyard*. Cambridge, Mass.: Harvard University Press.
- Guerra Currie, A.-M., R. P. Meier, and K. Walters. 2002. A cross-linguistic examination of the lexicons of four signed languages. In *Modality and structure in signed and spoken languages*, ed. R. Meier, K. Cormier, and D. Quinto-Pozos, 224–36. New York: Cambridge University Press.
- Hoyer, K. 2004. The sociolinguistic situation of Finland-Swedish deaf people and their language: Finland-Swedish Sign Language. In *To the lexicon and beyond: Sociolinguistics in European Deaf communities*, ed. M. Van Herreweghe and M. Vermeerbergen, 3–23. Sociolinguistics in Deaf Communities series, vol. 10. Washington, D.C.: Gallaudet University Press.
- Karttunen, F. 1994. *Between worlds: Interpreters, guides, and survivors*. New Brunswick, N.J.: Rutgers University Press.
- Kelly, W. P. 2004. History of the American Indian Deaf. In *Deaf studies today! A kaleidoscope of knowledge, learning, and understanding*, ed. B. K. Eldredge, D. Stringham, and M. M. Wilding-Díaz, 217–23. Orem: Utah Valley State College.
- , and T. L. McGregor. 2003. Keresan Pueblo Indian Sign Language. In *Nurturing native languages*, ed. J. Reyhner, O. Trujillo, R. L. Carrasco, and L. Lockard, 141–48. Flagstaff: Northern Arizona University.
- Kendon, A. 1988. *Sign languages of aboriginal Australia: Cultural, semiotic, and communicative perspectives*. New York: Cambridge University Press.
- Kroeber, A. L. 1958. Sign language inquiry. *International Journal of American Linguistics* 24: 1–19.
- Kyle, J. G., and B. Woll. 1985. *Sign language: The study of deaf people and their language*. New York: Cambridge University Press.
- Long, J. S. 1908–1910. The sign language: A manual of signs. *American Annals of the Deaf* 53–55(1): (230–49); 2: (438–48); 3: (23–37); 4: (140–60); 5: (213–81); 6: (239–47); 7: (420–38); 8: (142–55).
- . 1918. *The sign language: A manual of signs; being a descriptive vocabulary of signs used by the deaf of the United States and Canada* (reprint of 2d ed.). Washington, D.C.: Gallaudet College (Professional Printing).
- Long, S. H. 1823. *Account of an expedition from Pittsburgh to the Rocky Mountains*. Philadelphia: Edwin James.
- Lucas, C. 2001. *The sociolinguistics of sign languages*. New York: Cambridge University Press.

- Mallery, G. 1880. A collection of gesture-signs and signals of the North American Indians with some comparisons. In *Aboriginal sign languages of the Americas and Australia*. Vol. 1, ed. D. J. Umiker-Sebeok and T. A. Sebeok, 77–406. New York: Plenum.
- . 1881. Sign language among North American Indians. In *First annual report of the Bureau of Ethnology of the Smithsonian Institution for 1879–1880*, ed. J. W. Powell, 263–552. Washington, D.C.: USGPO. Reprint, New York: Dover, 2001.
- McKay-Cody, M. 1997. Plains Indian Sign Language: A comparative study of alternate and primary signers. Master's thesis, University of Arizona.
- McKee, D., and G. Kennedy. 2000. Lexical comparison of signs from American, Australian, British, and New Zealand sign languages. In *The signs of language revisited: An anthology to honor Ursula Bellugi and Edward Klima*, ed. K. Emmorey and H. Lane, 49–76. Mahwah, N.J.: Erlbaum.
- McNeill, D. 1992. *Hand and mind: What gestures reveal about thought*. Chicago: Chicago University Press.
- . 2000. *Language and gesture*. New York: Cambridge University Press.
- Mithun, M. 1999. *The languages of native North America*. New York: Cambridge University Press.
- Morford, J. 1996. Insights to language from the study of gesture: A review of research on the gestural communication of non-signing deaf people. *Language and Communication* 16: 165–78.
- Newell, L. E. 1981. A stratificational description of Plains Indian Sign Language. *Forum Linguisticum* 5: 189–212.
- Nover, S. M. 2000. History of language planning in deaf education: The 19th century. PhD diss., University of Arizona.
- Parkhurst, S., and D. Parkhurst. 2003. Lexical comparisons of signed languages and the effects of iconicity. In *Working papers of the Summer Institute of Linguistics, University of North Dakota session*. Vol. 47. <http://www.und.edu/dept/linguistics/wp/2003ParkhurstParkhurstPDF>.
- Pritchard, E. T. 2002. *Native New Yorkers: The legacy of the Algonquin people of New York*. San Francisco: Council Oak Books.
- Scott, H. L. ca. 1930. Indian Sign Language. *Kentucky Standard* (reprinted from the *Iowa Hawkeye*).
- . 1931–1934. *Film dictionary of the North American Indian Sign Language*. Washington, D.C.: National Archives.
- Stokoe, W. C. 1960. Sign language structure: An outline of the visual communication systems of the American deaf. *Studies in Linguistics Occasional Papers* 8. Rev. 1978, Silver Spring, Md.: Linstok.
- . 1972. *Semiotics and human sign languages*. The Hague: Mouton.

- Supalla, T. 1978. Structure and acquisition of verbs of motion and location in American Sign Language. Ph.D. dissertation, University of California, San Diego.
- Taylor, A. R. 1978. Nonverbal communication in aboriginal North America: The Plains Sign Language. In *Aboriginal sign languages of the Americas and Australia*. Vol. 2, ed. D. J. Umiker-Sebeok and T. A. Sebeok, 223–44. New York: Plenum.
- . 1997. Nonspeech communication systems. In *Handbook of the North American Indian*. Vol. 17, *Languages*, ed. I. Goddard, 275–89. Washington, D.C.: Smithsonian Institution Press.
- Tomkins, W. 1926. *Universal Indian Sign Language of the Plains Indians of North America*. Reprint, New York: Dover, 1969.
- Umiker-Sebeok, J., and T. A. Sebeok, eds. 1978. *Aboriginal sign languages of the Americas and Australia*. Vols. 1 and 2. New York: Plenum.
- Valli, C., and C. Lucas. 2000. *Linguistics of American Sign Language*, 3d ed. Washington, D.C.: Gallaudet University Press.
- Voegelin, C. F. 1958. Sign language analysis: On one lever or two? *International Journal of American Linguistics* 24: 71–77.
- Waldman, C. 2000. *Atlas of the North American Indian*. New York: Facts on File.
- Washburn, W. E., ed. 1988. *Handbook of North American Indians*. Vol. 4: *History of Indian-white relations*. Washington, D.C.: Smithsonian Institution.
- Weatherwax, M. 2002. *Indian Sign Language*. Videotape. Department of Blackfeet Studies, Blackfeet Community College, Browning, Montana.
- West, L. 1960. The sign language: An analysis. Vols. 1 and 2. Ph.D. diss., Indiana University, Bloomington, Indiana.
- Woll, B., R. Sutton-Spence, and F. Elton. 2001. Multilingualism: The global approach to sign languages. In *The sociolinguistics of sign languages*, ed. C. Lucas, 8–32. New York: Cambridge University Press.
- Woodward, J. 1978. Historical bases of American sign languages. In *Understanding language through sign language research*, ed. P. Siple, 333–48. New York: Academic Press.
- Wurtzburg, S., and L. Campbell. 1995. North American Indian Sign Language: Evidence of its existence before European contact. *International Journal of American Linguistics* 61: 153–67.