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gence to the earliest stone tools, then it is some two million years old. More recent writers have shortened the time span for various reasons—including the degree of sophistication in tool-making, and the extent of cooperative behavior among human group members as demonstrated in hunting, migrations, and other cultural achievements.

With each major cultural advance, we may infer that language has become a more powerful vehicle for thought. Over the millennia, language has been enriched in a mosaic fashion—partly as a result of development within groups, and probably even more with contact across groups as population density increased and interaction became more frequent (Wang 1982a). By thirty to forty thousand years ago, according to archaeologist Glyn Isaac (see Harnad et al. 1976:276), 'a kaleidoscopic diversity of forms and techniques were being utilized, and changes began to be breathtakingly rapid . . . Explicit traces of symbolizing and ritual become evident: burials with offerings, personal ornaments, engraved lines, representational painting, and sculpture.' General consensus holds that language had already evolved close to its modern form by that time; Swadesh 1971 has even proposed a reconstruction of that stage.

The anatomical approach to dating language emergence holds that spoken language could not have evolved without the critical transition to bipedal posture, which took place some three or four million years ago. This transition brought about radical modifications in the structure of the body, including the lowering of the position of the larynx, which can be shown to have significant advantages in the production of a diversity of sounds (Lieberman 1984).

Human brain size has grown rapidly over the past two million years. Measurements have been made of fossil skulls in the hope of dating language emergence. For some of these skulls, there is a left/right asymmetry, which may be evidence of language (as well as of right-handedness). Furthermore, a pattern of sulci in these skulls may correspond to speech areas in the modern human brain. These anatomical findings are tantalizingly suggestive. However, in interpreting them we must recall that similar asymmetries have been reported for brains of modern apes; furthermore, the relation between brain anatomy and function is extremely complex and little understood. We cannot, therefore, accept any datings on anatomical bases alone as conclusive. [See also *Lateralization of Language*.]

Over the past two decades, philosophical speculations on language origins have been replaced by experimental investigations, building upon a variety of scientific disciplines. The roots of language are also the roots of humanity. The fascination will surely continue, and we may expect increasing clarity and greater effectiveness in future studies on this question. [See also *Nonverbal Communication; Sign Language*.]

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ORTHOGRAPHY PLANNING. The development of writing systems for preliterate societies is discussed here in terms of the indigenous languages of North America, where the work has a history of several centuries. The considerations important to orthography design remain complex, however, because of the structural variety of the languages, the historical and socio-cultural contexts into which the systems are introduced, their projected uses, and their potential users.

There are currently a large number of mutually unin-

telligible indigenous languages spoken in North America. They are not all demonstrably related genetically: more than fifty different families are usually recognized. Some consist of a single language isolate, while others contain thirty languages or more. Some languages are spoken in small, relatively homogeneous speech communities, but others show extensive dialectal variation. [See North American Languages.]

The structures of the languages vary tremendously. Some have small phonological inventories; but many have elaborate ones, so that a large number of distinct symbols must be found. Some have relatively simple syllabic structure, while others exhibit a large number of syllable shapes. The choice between alphabetic and syllabic representation thus involves different technical considerations.

Perhaps more importantly, the depth of phonological alternation varies considerably from one language to the next. In some, like Lakhota, underlying forms are generally similar to their surface realizations; in others, like Caddo or Yupik, so many layers of phonological alternations have developed that underlying and surface representations barely resemble each other. Planners must decide what level of abstraction is appropriate for a practical orthography; they must consider not only what is most accessible to the consciousness of native speakers—easiest to learn, easiest to write with confidence, and most efficient for reading—but also which of these considerations should take precedence. Furthermore, many languages have extremely complex but productive morphologies. Bound morphemes in these languages typically perform many of the functions served by separate words in European languages. Planners must decide whether they wish to preserve the identity of morpheme shapes in their spelling systems.

Technical considerations—like the number of symbols necessary, the appropriate type of system for a particular language, and the optimal level of abstraction—are only a few of the factors that affect successful orthography planning. Orthographies now are rarely introduced into a vacuum. Many communities have a long history of literacy; in some, orthographies were developed entirely by the speakers themselves. Perhaps best known among these is the syllabary invented by Sequoyah for Cherokee at the beginning of the 19th century. Sequoyah neither spoke nor read English, although he had observed Whites reading. His system of eighty-five syllabic characters was quickly learned and used by almost all Cherokees; see Figure 1. Another syllabary was developed for Cen-

FIGURE 1. *Sequoyah's Cherokee Syllabary*. (From Ruth Bradley Holmes and Betty Sharp Smith, *Beginning Cherokee*, Norman: University of Oklahoma Press, 1976:2.)

Cherokee Alphabet.					
D _a	R _e	T _i	Ꭰ _o	Ꭱ _u	Ꭲ _v
Ꭶ _{ga} Ꭷ _{ka}	Ꭸ _{ge}	Ꭹ _{gi}	Ꭺ _{go}	Ꭻ _{gu}	Ꭼ _{gv}
Ꭽ _{ha}	Ꭾ _{he}	Ꭿ _{hi}	Ꮀ _{ho}	Ꮁ _{hu}	Ꮂ _{hv}
Ꮃ _{la}	Ꮄ _{le}	Ꮅ _{li}	Ꮆ _{lo}	Ꮇ _{lu}	Ꮈ _{lv}
Ꮉ _{ma}	Ꮊ _{me}	Ꮋ _{mi}	Ꮌ _{mo}	Ꮍ _{mu}	
Ꮎ _{na} Ꮏ _{na} Ꮐ _{nah}	Ꮏ _{ne}	Ꮑ _{ni}	Ꮒ _{no}	Ꮓ _{nu}	Ꮔ _{nv}
Ꮖ _{qua}	Ꮗ _{que}	Ꮘ _{qui}	Ꮙ _{quo}	Ꮚ _{quu}	Ꮛ _{quv}
Ꮝ _{sa} Ꮞ _s	Ꮟ _{se}	Ꮠ _{si}	Ꮡ _{so}	Ꮢ _{su}	Ꮣ _{sv}
Ꮤ _{de} Ꮥ _{ta}	Ꮦ _{de} Ꮧ _{te}	Ꮨ _{di} Ꮩ _{ti}	Ꮪ _{do}	Ꮫ _{du}	Ꮬ _{dv}
Ꮮ _{dia} Ꮯ _{tla}	Ꮰ _{tla}	Ꮱ _{tli}	Ꮲ _{tlo}	Ꮳ _{tlu}	Ꮴ _{tlv}
Ꮵ _{tso}	Ꮶ _{tse}	Ꮷ _{tsi}	Ꮸ _{tso}	Ꮹ _{tsu}	Ꮺ _{tsv}
Ꮻ _{wa}	Ꮼ _{we}	Ꮽ _{wi}	Ꮾ _{wo}	Ꮿ _{wu}	Ᏸ _{wv}
Ᏹ _{ya}	Ᏺ _{ye}	Ᏻ _{yi}	Ᏼ _{yo}	Ᏽ _{yu}	᏶ _{yv}

Sounds Represented by Vowels	
a, as a in father, or short as a in rival	o, as o in note, approaching aw in law
e, as e in hate, or short as e in met	u, as oo in fool, or short as u in pull
i, as i in pique, or short as i in pit	v, as u in but, nasalized

Consonant Sounds	
g nearly as in English, but approaching to k	g nearly as in English but approaching to k
h k l m n p q s t x y as in English. Syllables beginning with g except Ꭶ (ga) have sometimes the power of k. Ꭰ (go), Ꮃ (du), Ꮀ (dv) are sometimes sounded to, tu, ty and syllables written with ll except Ꮯ (tla) sometimes vary to dl.	

tral Yupik (Eskimo) by Uyakoq, who also neither spoke nor read English (Krauss 1973).

A number of systems originally introduced by Europeans were spread primarily by speakers. A syllabary devised by the Rev. James Evans in the 1830s for Ojibwa quickly spread among the Cree as well; within a few years, a majority of the Cree from the Quebec-Labrador Peninsula to the Rockies were literate in the system (Rhodes & Todd 1981, Murdoch 1982). The same system was adapted for other native languages, including Inuit and Athabaskan. Several orthographies for Micmac, developed by French missionaries, achieved widespread acceptance; a hieroglyphic system based on native symbols by Father LeClerq in the late 17th century was quickly learned and used by the entire nation. In the 18th century, Father Maillard developed an alphabet that was subsequently adopted by the Micmac. For Greenlandic, an alphabet based on Danish orthography was developed very early, and today supports almost universal literacy in Greenland. For Aleut, the Russian priest

Veniaminov developed an alphabet based on Cyrillic early in the 19th century (Walker 1981, Krauss 1973). Many speakers, especially men, became literate in this system, and letter-writing was reported to be widespread as late as the 1940s.

Older systems and their contexts must be considered carefully when new ones are devised. They often take on the aura of a traditional, and therefore correct system. Catholic missionaries among the Mohawk, for example, systematically used *i* for both [i] and [y]. This distinction was completely recoverable, since [y] occurs only before vowels, and [i] never does. But as Mohawks sought to modernize their orthography, they realized that the representation of [y] impinged on religious sensibilities.

In some communities, a benefit of literacy has been the establishment of ties with other groups who speak the same language. At the same time, the process of writing focuses attention on dialectal differences which speakers may scarcely have noticed otherwise. Considerations of correctness can turn to factional preoccupations that undermine the entire effort. For this reason, it is useful to have an orthography that is equally applicable to all varieties of a language. The phonetic values of symbols can be interpreted appropriately within each community, while higher-level differences are simply incorporated into the written record. In some cases, agreement on a minimal standard has been accomplished. Krauss 1973 points out that, of the three Greenlandic dialects, West Greenlandic (with the vast majority of speakers) has long been accepted as the standard. A number of differences have developed among Mohawk communities, but these have caused few orthographic problems: where one uses [r], another uses mainly [l]. Early missionaries wrote *r*, and this continues to be used in both communities. Higher-level differences are solved differently. Where one community uses [ty], the other uses [ky]; in each, the cluster is recorded as it is pronounced.

The success of an orthography is also closely tied to the uses for which it is destined. Walker 1981 notes that writing systems for Fox, Winnebago, Cherokee, and Mohican were widely adopted by speakers at times when their communities were separated by Europeans. The successful Cree and Eskimo systems spread quickly among small, remote communities, many with primarily nomadic lifestyles. Communication with distant friends and relatives was important. Many systems served religious functions: the Cherokee syllabary was used to read the Bible and to record sacred formulas; the Micmac

and Aleut systems introduced by missionaries were heavily used for religious purposes.

The size of a community and the volume of literary material it can produce affect orthographic decisions in several ways. Many communities do not expect to invest in special equipment to print new symbols. Many feel that it should be possible to write their language on a standard typewriter, so that more people can produce materials.

The volume of material produced is also a factor in the optimal level of phonological abstraction represented. Most English readers are exposed to written English every day. Assimilating the regular alternation rules necessary for interpreting a morphophonemic spelling is facilitated, because ample opportunity exists for readers to memorize and reinforce the spellings of words. For many North American languages, such opportunities for reinforcement will never exist: people will not begin the day by reading their language on cereal boxes and milk cartons; they will not read daily newspapers or novels in their language. A highly abstract system, necessitating a lengthy learning period, would have less chance of success in such communities.

Another variable in designing an appropriate orthography is its intended users. In earlier times, most were native speakers of the language, usually monolingual; they could supply non-predictable features to written material as they read. Thus writers of Ojibwa and Mohawk typically omit pre-consonantal *h* and distinctions of vowel length from their writing, even though these are not predictable. Mohawk writers typically omit tone, another feature not recoverable from surface representations. As in many European languages, stress is omitted by speakers of most languages, even when it is not systematic. Speakers formerly had little trouble in recovering such details—especially when reading familiar texts, such as the Bible, prayers, songs, or even letters. But now, in a number of communities, readers and even writers are increasingly likely to be non-native speakers. They are descendants of speakers, anxious to learn the language of their elders and to preserve as much as possible of their oral traditions. Their demands differ from those of their parents and grandparents. Unable to supply unpredictable material from a knowledge of the language, they require an explicit orthography, so that they can read anything they see and write anything they hear.

Most early Native users of orthographies differed in a second way from modern ones: they were not literate in

another language. Systems based on the roman alphabet presented no special pedagogical advantage, and alternative systems sometimes provided other advantages. As Murdoch 1982 and Krauss 1973 point out, the Cree and Inuit speakers who use syllabaries are fiercely attached to them; the systems are distinctively their own, and a source of great pride. Written materials are less accessible to outsiders, but that may not be undesirable.

By contrast, most modern users of new orthographies are already literate in another language, most often English. Roman-based systems are more accessible to them. Furthermore, many of these users feel that written languages are accorded a respect in the world that non-written languages never attain—and that, to gain such respect, their written languages should look as much as possible like established literary languages. They should be written not only with roman letters, but with capital letters and periods in appropriate places, and as few odd-looking symbols as possible. The use of an apostrophe rather than a question mark to represent glottal stop is thus preferred by Mohawks. Double vowels are preferred to colons representing length in Pomoan communities. However, problems can arise with orthographies that resemble English too closely. Thus a system was designed for Central Pomo that used the digraph *th* to represent an apico-dental series of stops, distinct from the alveolar series represented by *t*. Soon children began pronouncing the apico-dental stops like the interdental fricatives of English, despite oral instruction.

The style of transmission of new orthographies can be an important factor in their acceptance. In earlier times, children learned skills by observing their elders over long periods of time before making their own attempts. The transmission of writing to both children and adults was accomplished in personal, informal settings, rather than in the formal setting of a classroom or lecture. There were few authority figures and little coercion. It is felt by many that modern pedagogical techniques cannot enjoy the same success as traditional ones. Thus Walker 1981 notes that literacy among the Cherokee, in both Cherokee and English, has diminished drastically in this century, as teaching has shifted into the schools.

The development of literacy brings up a host of new issues, among them the definition of a true indigenous style. Some languages, like Greenlandic, have already developed rich literary traditions. Writers of many other North American languages learned to write a European language before they learned to write their own. They often developed the literary style appropriate to these

second languages, including basic Subject-Verb-Object order or the use of elaborate syntactic devices like relativization and complementation. Often their own languages are not characterized by the same devices; yet as they write, translations of European constructions appear. Indigenous complexity, such as stylistic use of word order and elaborate morphological constructions, can fade (Mithun 1985). As they develop their own literary traditions, these writers must decide which features of their spoken languages they wish to preserve in their writing, and which they want to modify for literary purposes.

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OTOMANGUEAN LANGUAGES constitute a family of Meso-America, primarily of Mexico. The internal subgrouping shown in Figure 1 is based on Lyle Campbell, 'Middle American languages', in *The languages of native America: Historical and comparative assessment*, ed. by Lyle Campbell and Marianne Mithun (Austin: University of Texas Press, 1979), pp. 915–916, apart from some changes in nomenclature. [For data on individual languages of the Chinantecan, Mixtecan, Otomanguean, Popolocan, and Zapotecan groups, see the articles under those titles. For languages of the other groups, see the Language List which follows.]

LANGUAGE LIST

- Amuzgo, Guerrero:** around 25,000 speakers reported in 1982, in southeastern Guerrero State. Population includes 87