orientation, some theorists have traced the emergence of technologies as governing determinants of human communication systems (see, e.g., Stevens & Garcia, 1980; DeFleur & Ball-Rokeach 1989, pp. 3–45, especially pp. 46–122). Others have accentuated cultural influences on human communication (see, e.g., Bremmer & Roodenburg, 1991).

The interaction between *culture* and *technology* (see glossary) is a particularly rich and rewarding study, and a host of scholarly endeavors are the foundation for our view of the history of human communication. We are profoundly influenced by some of these scholars, including Auerbach (1953), Havelock (1963), Clanchy (1979), Ong (1982), Logan (1986), and Lentz (1989). Although each examined a specific issue, many of their observations are historical, and their analyses are particularly relevant in constructing a history of human communication. We have integrated their understandings into a single historical framework that we believe has dominated the evolution of human communication.

This cultural and technological perspective of the history of human communication raises several important questions. These include the following: Has technology influenced human communication? Have technologies actually determined how systems of human communication have developed? Do cultural systems affect how communication technologies are used? How have technology and culture affected human understanding and cognition?

We respond to these questions by first proposing a scenario describing the history of human communication, followed by a discussion of the principles that forged this history.

A HISTORY OF HUMAN COMMUNICATION: TECHNOLOGICAL AND CULTURAL INFLUENCES

Three major stages or benchmarks in the history of human communication are noteworthy. These are the creation of the oral, literate, and electronic cultures.

The Oral Culture

The oral culture can be traced back to the beginning of *Homo sapiens* some four to five million years ago, but oral languages as we now understand them emerged 4,000–5,500 years ago. The growth of the global communication system, fostered by the mass production and distribution of books as well as by electronic media, has led to the view that oral modes of

communication are not as important as they once were. Yet for the vast majority of world cultures, orality continues to be the primary means by which societal values are transmitted from one generation to the next. Ong (1982, p. 7) has reported that of all of the thousands of languages, possibly tens of thousands, spoken in the course of human history, only about 106 have produced literature. Similarly, Edmonson (1971) concluded that only 3 percent of the spoken languages in the world today have a literature, and Maheau (1972, p. 83) has reported that two-fifths of the adult population of the globe—more than 700 million people—cannot read or write. Applying the United Nations Educational, Scientific, and Cultural Organization's (UNESCO's) definition of the minimum requirements for mass communication systems to 169 world cultures, Chaffee (1985b, 1986b) has reported that 51 percent of the world's nation-states are "pre-mass oral cultures" or "mass oral cultures," in contrast to the 11 percent that are "mass literate cultures," the 36 percent that are "mass literate-electronic cultures," and the 3 percent that are predominantly "mass electronic cultures." McHale (1972, p. 83) has reported that two billion people throughout the world do not have the basic facilities to use television, radio, and film as mass media. In all, orality is the world's dominant mode of communication. For the vast majority of the world's cultures, orality is the system that creates and sustains cultural values, concretizes the unique understandings embedded within those values, and transmits these values from one generation to the next. Based on these data, we use *oral culture* rather than oral communication because it more fully captures the dimensions of the object we are investigating. As we use the term, oral communication is not merely a mode of or channel for conveying information, but instead the primary perceptual and cognitive framework by which values are traditionally created, defined, sustained, and transmitted from one generation to the next.

At the same time, an oral culture is a product of a long and complicated process rather than of a single moment in which human beings began to communicate orally. Buettner-Janusch and Day (1987), professors of anthropology and anatomy, respectively, have reported that "no evidence exists to show how hominid language first developed," but they have also noted that "some generalizations from modern man may be justified" (p. 947). In this context, they have reported that the emergence of oral communication in early human beings depended on the development of "the cortex of the brain, an area that has expanded rapidly in hominid evolution" (p. 946) and the downward shift of the larynx "directly reflecting development of erect posture and expansion of the braincase" (p. 947). Such evolutionary changes, marked by fossil and toolmaking remains, provide a context for identifying specific stages in the development of oral communication.

Signal Communication

The first efforts to communicate were predominantly by nonlinguistic gestures and body movements. Vowel sounds later emerged, we would suspect, to emphasize these gestures. With time, neuroanatomical developments in the human being allowed gestures and vowel sounds to function as equally important dimensions in human interactions. As Buettner-Janusch and Day (1987) have suggested, "vowel sounds had their origins in nonlinguistic vocalizations" and "consonants were added as the hominids developed more control over their airways by manipulating tongues, lips, and teeth" (p. 947). At this stage in human development, gestures, body movements, and oral sounds would necessarily be linked to the representation of physical phenomena. Under such circumstances, gestures, body movements, and oral sounds would be externally oriented and function as devices designed to identify circumstantial events and relationships.

At the same time, these devices—gestures, body movements, and oral sounds—introduced new experiences into the life of the human being, for they created a new class or type of sensory data that had not previously existed. As these devices became a part of the learned experiences of human beings, they began to create a new system, aptly identified as *signal communication*. Signal communication led to profound, neuroanatomical changes in the human beings who used it, and also created a new awareness of the uniqueness of others as well as new social networks based on its use. As Buettner-Janusch and Day (1987) have reported, "Coupled with the ability to make the sounds necessary for speech would be changes in the brain that allow vocabulary to be stored and retrieved and changes in the auditory apparatus that allow language to be understood when spoken by others with slightly different intonation or pitch" (p. 947).

Without precise evidence, the functions of signal communication at this early stage in human development can only be hypothesized. However, the signal communication system of early human beings should have allowed them to achieve five objectives, as described by Ekman and Friesen (1969), who have provided a repertoire of nonverbal behaviors that are consistent with what is known about the development of early human beings. The authors have reported that nonverbal communication can function as emblems (i.e., when nonverbal acts function as equivalents of verbalizations), or to illustrate (i.e., visualize clarifiers and explainers), to display emotions (i.e., provide affective "statements"), to regulate or control, and, finally, to adapt to the self, others, and the environment.

At the same time, we have no evidence for suggesting that the functions that might have been achieved with the signal communication systems of early human beings can or should be understood as a product of the motivational schemes now associated with contemporary human beings. The possibility of committing an intentional fallacy looms extremely high. Indeed, Jaynes (1976) has suggested that the origin of consciousness may have been a product of the emergence of the bicameral brain. He has suggested that the communication of early human beings from as early as 3000 B.C. to as late as 1230 B.C. may have emanated from "a mentality utterly different from our own" (p. 68), and he has specifically argued that the "beginnings of action" were not to be found "in conscious plans, reasons, and motives" (p. 72). Similarly, Gordon (1971) has identified a solely signal period in the evolution of human communication that he characterizes as an "epoch of prehistory" (p. 26). Likewise, particularly when examining human evolution as a system, Bertalanffy (1968) has argued that a solely signal period of communication existed when human beings were necessarily motivated by only "biological drives" (pp. 216–219). He has suggested that "creative proception in contrast to passive perception," the ability to objectify "both things outside and the self," and "intention as conscious planning" must be examined within an "evolutionary framework" (p. 216). Distinguishing signal and symbolic communication systems, Bertalanffy has specifically argued that "the root of creative symbolic universes cannot therefore be reduced to biological drives, psychoanalytic instincts, reinforcement of gratifications, or other biological factors" (p. 216). These perspectives suggest that it is appropriate to distinguish signal and symbolic communication and to recognize that the communication system of early human beings may have been predominantly a signal system, and that a shift from a signal to symbolic orientation may parallel a series of related human developments, such as the emergence of human languages.

Symbolic Communication

The shift from *signal* to *symbolic* communication constituted a fundamental change. Before identifying how this shift affected human civilization, it is appropriate to distinguish signal and symbolic communication. Cassirer (1944/1965) has provided an initial base for distinguishing these two modes of communication. He initially distinguishes symbols and signals: "Symbols—in the proper sense of this term—cannot be reduced to mere signals. Signals and symbols belong to two different universes of discourse: a signal is part of the physical world of being; a symbol is a part of the human world of meaning" (p. 32). In Cassirer's view, "Signals are 'operators'; symbols are 'designators' " (p. 32). Thus, Cassirer concludes, "Signals, even when understood and used as such, have nevertheless a sort of physical or substantial being; symbols have only a functional value" (p. 32).

Signs and symbols both function as forms of communication when two or more people assign the same meaning to them. However, a sign functions as signal communication when the sign creates a shared universe of understanding of "the objective reference of a word. . . . For example, the denotative meaning of 'pencil' is *that which writes*. There are no personal interpretations of this meaning; it states an objective fact" (Blankenship, 1968, p. 20). In contrast, a symbol functions as symbolic communication when the symbol creates a shared universe of understanding

> beyond the objective meaning of the words. In fact, a word may have a purely objective meaning for one listener and a highly colored connotative meaning for another. Consider the word "spider." To the scientist accustomed to dealing impersonally with spiders, the word "spider" equals arachnid. But to the small child who has been badly frightened by a spider, the word "spider" not only carries with it the child's equivalent of "arachnid" but arouses a fear response as well. (Blankenship, 1968, p. 21)

In all, signal communication includes the use of words and nonverbal behaviors that create a shared universe of understanding regarding the objective referent of a word or nonverbal behavior; signs are denotative and predominantly identify the physical existence, physical characteristics, and physical functions of external phenomena. In contrast, symbolic communication includes the use of words and nonverbal behaviors that create a shared universe of understanding regarding the subjective associations of a word or nonverbal behavior; symbols are connotative, socially constructed by human beings, and emphasize the values people attribute to words and nonverbal behaviors.

The moment at which human beings began to use words and nonverbal behaviors both as signals *and* symbols may well have been the birth of civilization and the *Homo sapiens* (human beings as critical thinkers). Cassirer (1944/1965) has noted, for example, that there was a moment at which human beings "developed a new form: a *symbolic imagination and intelligence*" (p. 33). Burke (1952a) has argued that this new form of symbolic communication emerged when human beings used the word "no," for the "negative is a peculiarly linguistic resource" that does not exist in nature in any form (p. 251). As symbolic communication increased, human beings began to develop as we know them today, or as Walter and Scott (1973) have argued, "The growth and development of symbolization is almost synonymous with human growth and development" (pp. 240–245).

In human beings, the development of symbolic communication was marked by neuroanatomical changes. Buettner-Janusch and Day (1987) have noted that "the complexity of human behaviour is related to the human ability to interpret symbols, to appreciate abstract ideas, and to communicate them to others, particularly the young. Neuroanatomical studies show that these abilities reside primarily in the cortex of the brain, in areas that have expanded rapidly in hominid evolution" (p. 946). In greater detail, they have explained that the

> volume alone is not enough, and the level of differentiation and organization of brain tissue may also be of critical importance. The fossil record can yield only endocranial casts and, from them, possible brain volumes, but the firm association of stone tools with such remains must indicate a level of intellectual attainment that can foresee a use for a tool, envisage it within a stone, and then shape it to a set and repeatable pattern. (p. 946)

The ability to symbolize allowed human beings to create languages. In this context, a language is a social system of conventional and arbitrarily spoken symbols. When a language is defined in this fashion, special attention should be devoted to the fact that a language is social (a human creation or "contract" and agreement with others), systematic (i.e., an organized and established pattern creating redundancy and therefore predictability), conventional (i.e, a set of rules of conduct and behavior), and arbitrary (i.e., the creation and selection of specific words may have no substantial relationship to physical objects).

It is unknown when the first language was created. Williams (1982) has maintained that *Homo sapiens* developed the first language system in 34,000 B.C. (p. 28). Reflecting a larger consensus of opinion, the creation of the first language probably occurred around 5000 B.C. DeFleur and Ball-Rokeach (1989) have noted that modern linguistics "have identified large numbers of words in some fifty prehistoric vocabularies and in numerous modern languages that can be traced back as far as about 5,000 B.C. (some 7,000 years ago) to a proto-Indo-European 'common source' " (p. 17). They have concluded that "it can be suggested that this common source ultimately led back to the language originally developed by the Cro Magnon people. In any case, there is no question that the development of speech and language made possible great surges in human development" (p. 17). In this context, Buettner-Janusch and Day (1987) have specifically identified the new possibilities created when human beings began using languages. They have maintained that spoken language "allows human beings to name things with 'open' symbols; i.e., symbols that, in countless combinations, can be made to relay different messages. Not only can human communication cover immediate situations and feelings but also discussions at abstract or hypothetical levels" (p. 947). As a result,

concluded Buettner-Janusch and Day, "the human thus can store and transmit knowledge gained by past experiences, as well as discuss plans for the future" (p. 947).

The use of oral languages dramatically altered human behavior, particularly the ways in which human beings interacted with each other and organized themselves. In Chapter 4, in greater detail, we characterize the essential features of oral language as a human system as well as identify and examine the new interactional patterns created by oral languages. At this point, we would observe that oral languages created a new cultural system.

Because we now live in a social system mediated by oral, literate, and electronic modes of communication, we lack references that would allow us to experience and understand a culture governed solely by oral languages. Haynes (1988) has provided a hypothetical example that begins to reveal the cultural system created and sustained by a solely oral system of communication:

> One promising avenue is to consider what a nonliterate classroom might be like. No text, of course; no lecturing from outlines or notes, and, certainly, no notes would be taken. Oral discourse of a totally practical nature, fully interactive, conducted by a teacher who maintains active intellectual engagement with the audience would be the norm. Such a class might cover a body of theoretical material developed through literate means, but if the end is a practical one, that material would be considered only in the context of actual experience. As the class is led to experience, for example, changes in their predispositions, stimulated either through their own behavior or through that of the teacher, such experience is framed in theoretical terms, always with direct reference to immediate events. We have in mind, by the way, skills-oriented courses in human communication. To gauge the extent one's own institution is biased by literacy in the sense discussed above, one need only imagine the furor such a nonwriting based course would create. (pp. 96–97)

As Haynes's example suggests, a culture mediated by only oral communication would necessarily differ dramatically from cultural systems dominated by writing, print, and electronic modes. Ong (1982, pp. 37–57) has identified several distinct features of a culture mediated by orality that we examine in Chapter 4. At this juncture we need only illustrate how systems of thought change as one moves from the oral to literate to electronic culture. The nature of knowledge functions as a useful example, and, as we might anticipate, the nature of knowledge changes as one moves from an oral to literate to electronic culture. Explaining these shifts, Chesebro (1989) has noted,

> In an oral culture, the knower and what is known are related. Accurate and reliable knowledge require direct social interaction, participation in the lived experience, and exposure to the imminent and immediate source of knowledge. However, in a literate culture, the knower and what is known are typically unrelated. The sociological and personal features of the source of the printed word are unlikely to be known. Indeed, in a literate culture, sources are likely to be, at best, ambiguous and receivers unpredictable. Once our words appear in print, we have no idea who will read them or how they will react. In contrast, the nature of knowledge is dramatically different in electronic modes such as television and film. While the knower and what is known are reunited in electronic media such as television and film, knowledge is separate from the lived experience. Television and film conceptions of "what is" report only what can be seen and heard; but more importantly, this visual and auditory conception of "what exists" is typically understood within a totally unrelated context (the home or the movie theater), a context which did not characterize the original situation. Context-defining influences are thus lost in the electronic culture. (p. 12)

As these examples suggest, each medium of communication creates a selective perception of reality (Chesebro, 1984, p. 116–124). The oral mode draws attention to the immediate presence of the speaker, the physical relationship between speaker and listener, and the speaker's unique verbal and nonverbal behaviors, all of which are understood within the immediate context in which the interaction occurs. Accordingly, perception or what is "understood to be" in the oral context is a function of the appreciation and experience of the merger of or the forging of linkages among the immediate elements in the communication process. As Ong (1977) has noted, "Oral utterance thus encourages a sense of continuity with life, a sense of participation, because it is itself participatory" (p. 21)

Additionally, without the benefit of writing, print, and electronic recording devices, if ideas are to be retained, they must be memorized. But, as Opland (1983, p. 158) has noted, even if mnemonic devices are used and verbatim recall is sought, repetition produces agreement with the original source only 60 percent of the time. What is permanent and what can be permanent within an oral culture is thus dramatically different than in literate and electronic cultures, simply because writing, print, and electronic recording devices virtually eliminate recall as an issue. If the oral culture is to sustain itself, if the values of the community are to be transmitted from one generation to the next, then delivery and memory must necessarily become its critical rhetorical canons. As we shall suggest later, given their technological constraints, the canons of style, arrange-

ment, and invention become far more important in cultural systems mediated by literate and electronic communication systems (Chesebro, 1989, pp. 9–17).

The Literate Culture

Webster's Third New International Dictionary of the English Language Unabridged and Seven Language Dictionary (1986) defines a *literate* person as "one who can read and write" and *literacy* as "an ability to read a short simple passage and answer questions about it" (p. 1321). The mastery of two modes of communication, *writing* and *print*, established literacy as a critical human skill and ultimately became a standard for defining what civilized and civilization mean. Noting that "literacy is in no way necessary for the maintenance of linguistic structure or vocabulary," Robins (1987, p. 585), a professor of general linguistics, has argued that "literacy has many effects on the uses to which language may be put," including the "storage, retrieval, and dissemination of information [which] are greatly facilitated [by literacy], and some uses of language, such as philosophical system building and the keeping of detailed historical records, would scarcely be possible in a totally illiterate community. In these respects the lexical content of a language is affected, for example, by the creation of sets of technical terms for philosophical writing and debate." Robins has concluded, "Because the permanence of writing overcomes the limitations of auditory memory span imposed on speech, sentences of greater length can easily occur in writing, especially in types of written language that are not normally read aloud and that do not directly represent what would be spoken" (p. 585). In this regard, the development of two modes of communication, *writing* and *print*, has fostered the unique functions of literacy, which are considered here one at a time.

Writing

The first oral language, formulated in approximately 5000 B.C., some 7,000 years ago, preceded by some 3,000 years the development by the Seirites of the first principles of phonetic alphabetic writing—known as the Proto-Sinaitic script—in the Sinai and Canaan in 2000 B.C. The Seirites, referred to in the Bible as the Kenites or the Midianites, sojourned with Moses in the desert of Sinai during the exile from Egypt. Some believe that the Seirites may have simplified the hieroglyphics of the Egyptian writing system by selecting and developing only the uniconsonantal signs of the latter stages of Egyptian writing. Regardless of its origins, the Proto-Sinaitic script, according to Logan (1986) operated "according to a phonetic acrostic principle whereby each sign represents an object and

the sound value of the sign is the same as the first consonant of the name of the object depicted" (p. 34). In greater detail, Logan has reported,

> Words are spelled out phonetically using the names acrostically. For example cat would be spelled by picturing a can, an apple, and a table in sequence. Some of the signs in the Egyptian and Seirite system were similar. The twenty-two Seirite signs, however, had their own Semitic names and sound values. As with the Egyptian uniconsonantal signs, the Proto-Sinaitic alphabet consisted solely of consonants. The vowels and vocalization of speech were not indicated and had to be filled in by the reader. (p. 34)

Although the Seirites were the first to employ the basic principles of phonetic alphabetic writing, because they were unable to consistently reflect vowels in a phonetic alphabetic system, technically they did not develop the first fully phonetic alphabetic writing system. It was the Greeks, some 500 years later, in 1500 B.C., who invented the first fully developed system of phonetic alphabetic writing.

Clearly, the phonetic alphabet was not directly derived from spoken language. Dating back to 30,000 B.C., the first forms of human notation were actually notches on animal bones to record quantities. To reflect qualitative information, this notation system developed into a system of pictographic signs (i.e., pictography, semasiography, ideography, or subwriting) in which a written visual image or nonverbal picture is intended to identify, represent, and recall objects or beings. It remains unclear, however, if pictographic signs did or could function as an effective mode of human communication. Goldblatt (1987), a professor of Chinese, has reported, for example, that the first Chinese hieroglyphics were "an impediment to education and the spread of literacy, thus reducing the number of readers of literature; for even a rudimentary level of reading and writing requires knowledge of more than 1,000 graphs, together with their pronunciation" (p. 257).

Following the development of pictographic signs, phonographic systems emerged in which written signs had a correspondence to language sounds, but the written signs continued to reflect a visual orientation (e.g., the oral statement "I saw" might be reflected in written form with an image of an eye and a saw). As developed in the Sumerian writing system, pictographic and phonographic signs gradually began to include phonetic concepts. Subsequently, the Sumerians began to employ one written sign for each word (i.e., a logographic system).

The logographic system evolved into a more fully developed phonographic system in which each word is represented by its component syllabic sounds, as reflected in the Proto-Sinaitic script developed by the

Seirites in approximately 2000 B.C. Ultimately, the first fully developed phonetic alphabet was developed by the Greeks in approximately 1500 B.C. Gelb (1987), a professor of linguistics, has maintained,

> If the word "alphabet" is understood as writing that expresses the single sounds (i.e., phonemes) of a language, then the first alphabet was formed by the Greeks. Although throughout the 2nd millennium BC several attempts were made to find a way to indicate vowels in syllabaries of the Egyptian-Semitic type, none of them succeeded in developing into a full vocalic system. . . . while the Semites made sporadic use of these indicators, called *matres lectionis*, the Greeks used them systematically after each syllabic sign. (p. 986)

Accordingly, Gelb has reported that "it was therefore the Greeks who, having accepted in full the forms of the West Semitic syllabary, evolved a system of vowel signs that, attached to the syllabic signs, reduced the value of these syllabic signs to simple consonantal signs, and thus for the first time created a full alphabetic system of writing" (p. 986). From that time, however, few changes have occurred in the basic nature of the alphabet. As Gelb has aptly concluded, "In the past 2,800 years the conquests of the alphabet have encompassed the whole of civilization, but during all this period no reforms have taken place in the principles of writing. Hundreds of alphabets throughout the world, different as they may be in outer form, all use the principles established in the Greek writing" (p. 986). However, the power of the communication system developed by the Greeks was not to be fully realized until the development of print.

Print

As far as we know, the first printing press was a product of sixth century Chinese ingenuity, but mass-produced movable type fonts with one alphabet letter per font were probably invented by Gutenberg in the mid-1440s. As editors Unwin and Unwin (1987) have suggested, "Printing seems to have been first invented in China in the 6th century AD in the form of block printing. Other Chinese inventions, including paper (AD 105), were passed on to Europe by the Arabs but not, it seems, printing" (p. 457). As they trace the evolution of printing, Unwin and Unwin have reported, "The invention of printing in Europe is usually attributed to Johannes Gutenberg in Germany about 1440–50, after a period of block printing from about 1400. Gutenberg's achievement was not a single invention but a whole new craft involving movable metal type, ink, paper, and press. In less than 50 years it had been carried over most of Europe, largely by German printers" (p. 457).

Historically, the effect of printing on book production was amazing. In a 50-year period, from 1450 to 1500, the number of books increased in Europe from "scores of thousands" to "more than 9,000,000" (Unwin & Unwin, 1987, p. 462). Consequently, Bramson and Schudson (1987) have noted: "The invention of the printing press in the 15th century had been the beginning of a movement that spread with the growth of literacy and technological innovations in printing and marketing. The circulation of books and pamphlets spread, and literacy levels in Europe advanced markedly" (p. 941).

The impact of print and literacy was equally significant in the United States. The first printing press arrived in the United States in 1683. In 1741, America's first magazine appeared. The "penny press" was initiated in New York City in 1848, and comic books appeared in 1889.

From a broader but equally important historical perspective, the modes of human communication were also undergoing a massive transformation at an ever-increasing rate of change. Some 30,000 years had passed between the first known uses of signal communication by human beings in 34,000 B.C. to the development and use of the first known oral and symbolic languages in 5000 B.C. Some 3,500 years had passed between the development of languages in 5000 B.C. to the development of the first fully phonetic alphabetic writing system by the Greeks in 1500 B.C. Some 3,000 years had passed between the development of the phonetic alphabet in 1500 B.C. and the contemporary printing press in A.D. 1450. Each of the successive "revolutions" in human communication technologies was occurring more quickly.

We believe that each successive communication technology exerted a greater change on the social fabric of human beings. We would hold that with the development of the written system of communication, the phonetic alphabet fundamentally changed the ways in which human beings understand. The basic unit of human communication became the individual word. In the oral culture, the basic unit of human communication was a complex set of interactions that included the character and role of the speaker, the verbal and nonverbal delivery of the speaker, the context in which the speech occurred, and the listener's sense of the immediacy and relevancy of the entire speaking occasion. In the written mode, human contact is made through words constructed from a phonetic alphabet that may bear little resemblance to what is—or can be—directly experienced in everyday life. The symbolic relationship created between writer and reader was contained in words that, once preserved in written form, could exist as meanings independent of either the writer or the reader or the context in which the words were written and read. For the first time in human history, writing allowed human beings to interact through a series of abstractions, the words created by the phonetic

alphabet. In like manner, printing exerted an equally profound effect on human communication. Indeed, Logan (1986), as well as several others, has maintained that print created a series of new social institutions, including mass education and mass literacy, as well as influencing the rise of visual thinking and science, the endurance of the Renaissance and the Reformation, individualism, nationalism, and the Industrial Revolution (see also Clanchy, 1979; Illich & Sanders, 1988; Luria, 1976; Ong, 1982).

Once print and the new social institutions created by print were established, print may also have begun to alter oral communication. As Ong (1977) has noted, "Talk, after writing, had to sound literate—and 'literate,' we must remind ourselves, means 'lettered,' or post-oral" (p. 87), for "writing grows out of oral speech, which can never be quite the same after writing is interiorized in the psyche" (p. 339). Ong has concluded that "writing leads verbalization out of the agora into a world of imagined audiences—a fascinating and demanding and exquisitely productive world. Print grows out of writing and transforms the modes and uses of writing and thus also of oral speech and of thought itself" (p. 339). Such claims intrigue us, and we explore the social implications and consequences of writing and print in Chapter 5.

The Electronic Culture

As we noted earlier, once communication systems began to develop, the successive "revolutions" have been engendering massive transformations at an ever-increasing rate of change. Some 3,000 years had passed between the development of the phonetic alphabet in 1500 B.C. and the contemporary printing press in A.D. 1450, but only 400 years passed between the development of the printing press in 1450 and the first electronic modes of communication in 1844. Rogers (1986) has identified the date most frequently associated with the development of electronic modes of communication, reporting that "the first electronic telecommunication occurred on May 24, 1844, when Samuel Morse, inventor of the telegraph, sent the famous message, 'What hath God wrought?' from Baltimore to Washington, D.C." (p. 29). Rogers has also captured the impact of this change: "Until that time, information could travel only as fast as the messengers who carried it; communication of information and transportation of people and materials were not separated in meaning. But, the telegraph changed all that; a network of 'lightning lines' soon crossed the nation. The electrical messages that crackled along these wires were many times faster than the fastest trains, whose rails the telegraph wires paralleled" (p. 29).

The first significant impact of the telegraph was on the print medium. In 1844, newspapers seldom carried daily national and international news

items. However, as Czitrom (1982) has noted, the telegraph "made possible, indeed demands, systematic cooperative news gathering by the nation's press" (p. 16). Therefore, the Associated Press (AP) was formed in 1849.

Once the principle was established, electronic modes of communication proliferated, and, compared to prior communication developments, the proliferation was amazingly rapid and pervasive. The first successful motion picture camera was developed in 1889, and *The Great Train Robbery* was released in 1903. In 1897, the first wireless telegraph was patented, and in 1906 the first successful radio system was demonstrated. In 1877, Thomas Edison filed the first patent for a "talk machine," and in 1925 the first electrical system for recording and playing back sound was perfected. In 1922, the first electronic television system was designed, and the first commercial television was broadcast in 1939. And, while the principles of contemporary computing theory can be traced back to the mid-1660s, the basic principles for electronic computerization were developed by Charles Babbage in the early 1800s, and the first electronic computer unveiled in 1946 by the Moore School of Engineering at the University of Pennsylvania (Chesebro & Bonsall, 1989, pp. 25–26).

The societal and individual consequences of these new electronic media systems are still emerging. Indeed, the shift from telecommunication (i.e., one-way transmission of messages from source to receivers) to interactive (i.e., two-way transmissions between source and receivers) electronic communication systems is less than 50 years old, yet, compared to print, the electronic media have already altered what is perceived, how it is perceived, and the kinds of understandings that these electronically generated perceptions can mean. Television and film function as apt examples. These media highlight how the electronic technologies have altered what is perceived as information. They also illustrate how theories of communication have had to shift from a focus on arrangement and style, the dominant rhetorical emphases of the print medium, to the new emphasis on invention in the world of electronic media. Chesebro (1989) has previously explained that

> the visual component of electronic media such as television and film highlights motion. The apparent motion within a frame, the movement embedded within the progression of shots, and the series and sequences of shots in one location and from one location to another location defines what is known (see, e.g., Harrington, 1973). The traditional notions of arrangement and style which characterize literate cultures are dramatically altered in such electronic media. The constant motion characterizing all electronic media reflects, not only metaphorically but literally, a search and quest, or what has been identified in classical rhetoric as a concern for invention. (p. 12)

The consequences of these shifts for understanding and knowing have been dramatic:

> While the knower and what is known are reunited in electronic media such as television and film, knowledge is separated from the lived experience. Television and film conceptions of "what is" report only what can be seen and heard; but more importantly, this visual and auditory conception of "what exists" is typically understood within a totally unrelated context (the home or the movie theater), a context which did not characterize the original situation. Context-defining influences are thus lost in the electronic culture. (Chesebro, 1989, p. 12)

The details of these new implications are explored in Chapter 6.

PRINCIPLES FOR CONSTRUCTING A COMMUNICATION HISTORY

The conception of communication history offered here is intentionally selective, and therefore, as we noted and anticipated at the outset of this chapter, this historical sketch admittedly provides both an incomplete and a unique view of communication history. We have deliberately *not* emphasized major political and military events, leaders, speeches, and strategies that have exerted influences upon why and how human communication has evolved as it has. We believe our approach is a useful way of identifying significant moments in the history of human communication. As our descriptions of this history suggest, our approach focuses upon how two basic dimensions of human communication, *culture* and *technology*, provide explanations for the evolution of human communication that other approaches are likely to slight.

By way of explaining this cultural and technological orientation, the assumptions of this approach will now be appropriately highlighted. Some of these assumptions are definitional, others methodological, while some posit theoretical conceptions of communication itself. To identify the nature of these assumptions as explicitly as possible, eleven specific claims are highlighted and numbered sequentially in the following pages. For clarity, we have found it convenient to deal initially with our assumptions about the nature of media systems, then to turn to how cultural systems are understood in this volume, and finally to consider how technologies and cultural systems interact.

1. *A medium of communication is an active determinant of meaning.* *Webster's* (1986) has defined a *medium* as "something lying in a middle or intermediate position," "a middle way," as "something through or by which something is accomplished, conveyed, or carried on," and as "the material or technical means for artistic expression" (p. 1403). In traditional conceptions of the communication process, the medium of communication is frequently treated as a *channel*. In his classical conception of the communication process, Berlo (1960) proposed that the channel was one of the six "elements that all communication situations have in common," and he defined a channel as "a medium, a carrier of messages" (p. 23). Yet Berlo also conceived of the channel as an active determinant of the meanings humans receive when they communicate. He held that "the *choice* of channels often is an important factor in the effectiveness of communication" and that the channel is one of the "ingredients of communication" (p. 28). Specifically, he suggested that the channel of communication functioned as the "encoding and decoding apparatus" that allows "external physical" stimuli to be "translated internally," ultimately functioning as the "encoding" and "decoding" system for all human communication (pp. 63–64). Cast as the perceptual or encoding/decoding system that gives order to external stimuli, the channel or medium of communication cannot reasonably be treated as only or as merely a "conduit of a message." In terms of microanalyses, media systems such as television news formats can shape public attitudes and ultimately social policy (see, e.g., Altheide, 1991). In terms of macroanalyses, media systems can be conceived as "constructs" or "organized schemas or patterns of expectation within which events are construed or interpreted. Any event can make sense only in so far as it is ordered within the construct system" (Delia & O'Keefe, 1979, p. 161). In all, reasoning that "there is nothing innate in the human nervous system which gives us direct information concerning space," and that "there is no specialized space receptor," Strauss and Kephart (cited in Wachtel, 1978, pp. 376–377) have maintained that "every medium has a bias toward space and time. Each, in its own way, imposes an order and a coherence on the world. This is not only true of language, but of all the new technologies and techniques that present experience in symbolic form" (see also Carpenter & McLuhan, 1960).

2. *The medium of a message generates a different kind of knowledge than the content of a message.* Focusing on both the development and cultivation of learning, Salomon (1979) has maintained, "When a medium's messages are encountered, knowledge of two different kinds are acquired: information about the *represented world* and information about the *mental ability* used in gaining it" (p. 55). He has concluded, "Thus, while the *contents* of messages and experiences address themselves to one's knowledge and map upon one's knowledge base, the ways they are structured and presented address themselves to one's mental skills or abilities" (p. 55).

In this sense, the medium employed to present information deter-