CRITICAL TERMS FOR MEDIA STUDIES

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21 :: WRITING

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A bone, a pebble, and a ramskin . . . Thus an inventory of primordial objects that James Joyce evokes in his novel *Finnegans Wake* to distinguish writing from other media. The setting forth of writing in this manner draws our attention to the stark muteness of three-dimensional tokens or two-dimensional surfaces on which all inscriptions begin and end. This insight is worth pondering insofar as it permits us to reckon with the biomechanics of writing as a technology. But is writing not a system of representation like other visual and verbal codes? Yes, there is no doubt about it, and we will address the symbolic function of writing in due course. As we launch into the subject, it is important to keep it in mind that writing came into existence first and foremost as a technology—an early invention that made first civilizations, empires, long-distance trade and communication, and urbanization possible. From clay tablets to microchips, writing involves at least a twofold process of preparing material surfaces on which signs or codes are to be inscribed and of coordinating the human motor skills (or prosthetic robot arms) required to make the inscription.[1] In the age of informatics and computer technology, writing increasingly penetrates the biomechanics of human speech to the extent that sound, including speech, is now being turned into an artifact, a notable example being text-to-speech (TTS) synthesis.[2] The colossal amount of written and printed record and electronic information stored in data banks, libraries, museums, archival centers, and global communication networks further indicates how much the technologies of writing and print have evolved to shape modern life and the future of humanity, with major implications for our planetary and interplanetary ecology.

Civilization is unthinkable without writing.[3] This common observation entails a critical reevaluation of the concept of civilization itself (and of barbarity) which lies beyond the scope of this essay.[4] Insomuch as the presence or absence of writing is always evoked, explicitly or implicitly, as a positive index in the ranking of human societies and their intellectual attributes, we need to come to a basic understanding of what writing is and what it does and ask why the stakes are generally very high in discourses on this subject.[5] In this essay, we identify and discuss six key registers concerning writing and consider their implications for understanding politics, technology, history, and socioeconomic organization: (1) How much do we know about the origins of writing? Is the question of origin inevitable and important? (2) In what sense is literacy central to political governance and imperial projects, past and present? What kinds of social, territorial, and political control are exercised on a population by the ruling class, the state, or empire through writing? (3) By what script and visual medium is writing to be known or knowable? How do alphabetical and nonalphabetical writing, on the one hand, and mathematical and cryptographic symbols, on the other, compare in the context of a broader semiotic conception of the visual/verbal/spatial production of meaning? (4) How did writing evolve from antiquity to the invention of print and mass media? This bears upon the technological dimensions of writing that open the dialectic of orality and literacy to further inquiry in light of mechanical (re)productions of the audiovisual sensorial continuum. (5) Is writing a visual representation of speech? This familiar issue brings a number of different positions into play, including structural linguistics, metaphysics, and grammatology; our discussion will highlight the relevance of these positions to some of the other registers treated in this essay. (6) Finally, in what ways does digital media transform the idea of alphabetical writing to take us where we are, or into what media theorist Marshall McLuhan termed "a global village"?

The past century has witnessed spectacular archaeological discoveries that make it easier than ever for scholars to map out the writing systems of the world and hypothesize their origins. Whereas the iconographic origin of writing is widely observed across civilizations, scholars disagree as to how one might interpret ancient iconic signs, such as petroglyphs or Amerindian pictographs, as instances of writing. The beginnings of Mesopotamian writing, or proto-cuneiform, are commonly dated to the end of the fourth millennium BCE, the first consonantal alphabet in Phoenicia to 1200 BCE, and the adoption of alphabets in Greece to 750 BCE.[6] Direct archaeological evidence suggests that a well-developed form of Chinese writing already existed in the last quarter of the second millennium BCE.[7] The evidence brought to light thus far has given scholars good reason to believe that the earliest scripts were invented separately in different parts of the world by at least four sedentary civilizations characterized by urbanization, division of labor, and a surplus economy: Mesopotamia, Egypt, China, and Mesoamerica.

I. J. Gelb, who defines writing as "a system of human intercommunication by means of conventional visible marks," sees iconic signs as the precursor to full writing systems and terms such signs "semasiographs."[8] Florian Coulmas believes that a major conceptual shift took place when the visual representation of an object began to be differentiated from a system of writing that transcribed the *name* of the object.[9] (Coulmas's emphasis on "objects" and their nominal properties, however, appears to rule out the consideration of graphic movement or a "syntactic" understanding of graphism.) The widespread use of the rebus principle in early logographic developments would have corresponded to this conceptual shift.[10] In general, scholars who are keen on developing a general concept of writing on the basis of linguistic theory have tended to downplay the importance of iconicity and to treat non–language-related instances of graphism as nonwriting.[11] The majority of them insist that, regardless of scripts, all full writing systems (broadly classified as alphabetic, syllabic, logographic, or phonographic), must meet the criterion of adequate phonetic representation of language.[12] Is this view of writing defensible from the standpoint of media and semiotic considerations? Since our immediate focus here is media and writing rather than phonetic symbolism narrowly conceived, it behooves us to open the issue to broad social vistas beyond the horizons of linguistic representation. The issue of phonocentrism is something we will deal with later, but suffice it to mention that the anxieties surrounding the role of iconicity in writing in the West are not new and have been subjected to critique by many philosophers, historians, and literary theorists, the foremost among whom was the late French philosopher Jacques Derrida.

Our knowledge of the earliest beginnings of writing is necessarily restricted by the precarious state of archaeological evidence and by the condition of a posteriori record keeping that hinges on the existence of writing. Whereas the exact circumstances of how and why writing was invented may never be known, all ancient civilizations appear to have been acutely aware of the earthshaking significance of such inventions. This is amply attested by the universal accounts of the mythical origins of writing. Egyptian documents name Theuth of Hermopolis as the inventor of writing, for which their king Thamus, according to Plato in *Phaedrus*, both applauded and criticized him.[13] In Mesopotamia, the god Nabu was revered by Sumerian scribes as the inventor of writing. Nabu's emblem consists of a table and a stylus in the shape of a single wedge or two wedges, the lower pierced by the upper one. In ancient Chinese legends, Cang Jie's invention of writing is said to have caused Heaven to rain millet and ghosts to wail in the night.[14] In India, where primacy has been attached to transmitting the sacred Vedic texts orally from one generation to another, writing was highly esteemed in its antiquity. Ganesh, the elephant-faced god of wisdom, was credited with the invention of writing and is said to have broken off one of his tusks to use as a pencil.[15]

These legends bear witness to the magical power of writing and the upheavals caused by its introduction into societies previously dominated by oral communication, but they tell us little about how and why writing emerged. Since no direct means exist that will give us firsthand knowledge about prehistoric language and the origin of writing, scholars have speculated on the basis of available evidence or by analogy with so-called primitive or preliterate societies in the present day. Of the multifarious theories they have advanced, André Leroi-Gourhan's paleontology of writing offers some of the most interesting theoretical speculations to date. In his book *Gesture and Speech*, Leroi-Gourhan examines the evidence of excavated fossil anthropoids preceding *Homo sapiens* to gather clues about their tool-making and symbol-making activities. Dating what he calls "the birth of graphism" among the late Palaeoanthropians to roughly 35,000 BCE, he notes neurological linkages between the hand/tools and the face/language, as well as their simultaneous participation in the construction of communication symbols:

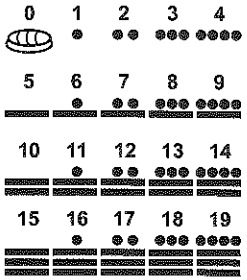
> Humans, though they started out with the same formula as primates, can make tools as well as symbols, both of which derive from the same process or, rather, draw upon the same basic equipment in the brain. . . . As soon as there are prehistoric tools, there is a possibility of a prehistoric language, for tools and language are neurologically linked and cannot be dissociated within the social structure of mankind. (1993, 113)

Leroi-Gourhan believes that graphism and language have never been mutually exclusive, just as gesture has always paralleled speech in the development of mind and language. This insight appears to anticipate the notion of arche-writing (*arche-l'ecriture*) that Derrida would develop later, which contests the predominant view that writing is a secondary symbolic system vis-à-vis speech.[16] More importantly, Leroi-Gourhan's emphasis on the mutual embeddedness of human labor and symbol making renders the narrow issue of "the origin of writing" a moot point. The more meaningful question we must pose is, What were the prehistoric conditions of labor, symbol making, and social organization that contributed to the evolution of humans and their civilizations (see chapter 5, "Memory")? To this question no one has a definitive answer, but the angles provided by the question itself may guide us toward a better understanding of observable traces of comparative conditions in ancient civilizations.

The magical power attributed to writing by the mythological accounts we have observed provides some useful hints as to how theocratic and imperial authorities in ancient Egyptian, Sumerian, Chinese, Mesoamerican, and other ancient civilizations might have exerted control or monopoly over the written sign and written document. Just as literacy is about access to power and upward social mobility in modern society, writing in ancient civilizations marked the social division between those who had access to knowledge and power and those who did not. The complexity of social organizations in Egyptian, Babylonian, and Chinese civilizations—often associated with record keeping, accumulated wealth, religious power, commerce, law and treaty making, and so on—conferred special prestige upon writing and, by extension, scribes. Priests, who were often scribes, sometimes held a monopoly of knowledge through which they dominated the organizations of political power. When Hammurabi completed the transition from Sumerian script to Akkadian and made the Semitic language official, he claimed that he had received the laws from the god of justice in order to subordinate the ecclesiastical establishment to civil courts.[17]

Insomuch as writing as social practice cannot be separated from religion, law, politics, and commerce, it is inextricably associated with the emergence of new spatial/temporal configurations and new forms of geopolitical consciousness (see chapter 7, "Time and Space"). If "the city as a form of social organization is unknown among oral cultures," writing is so much more linked with empire making, because spatial expansion and bureaucratic centralization presuppose efficient communication across long distances.[18] Harold A. Innis suggests that the monarchies of Egypt and Persia, the Roman Empire, and the city-states should be understood as products of writing (Innis 1972, 10). In China, writing was the first thing that drew the attention of the first emperor, Qin Shi Huang of the Qin Dynasty (221–206 BCE), upon his successful imperial conquest. The emperor outlawed a multiplicity of scripts that had existed before his rule and imposed a standard script (the square-block characters still in use today), standard orthography (the minor *zhuan*, or seal calligraphy) and standard legal codes and bureaucratic procedures, along with uniform weights and measure, uniform coinage, uniform imperial road widths, and so on, all in the service of centralized rule. Thus began a more than two millennia of imperial historiography in China, an unbroken record unique among world civilizations. This deep historiography would have been unthinkable outside of a textual tradition supported by successive imperial rule and a standard written script.[19]

Weights, measures, and currency presuppose accurate numerical notation and record keeping, which appear to have played a seminal role



The Mayan vigesimal numerical system consists of three symbols: a dot (one), a dash (five), and a shell (zero).

in the development of ancient writing. The striking predominance of numerical notations—using pebbles, tallies, tokens, and clay containers (*bullae*)—in some of the earliest recorded commercial transactions, which date back ten thousand years, has caused some theorists to view mathematics as the earliest precursor to writing.[20] Rather than evolving, as many suppose, from pictograph to syllabic writing and then to phoneticization, writing systems could have emerged from a much more complex set of semiotic situations than the single need to record human speech. This conjecture is tangentially supported by the etymology of the Phoenician word *spr*, to which the English word *scribe* (and its Latin root and Greek equivalent) can be traced. The Phoenician word descended originally from the verb *to count* and did not acquire the meaning *to write* until later.[21] This shared ancestry for "inscription" and "counting" sheds interesting light on the alphabet as an alphanumerical system in addition to being a phonetic tool. In ancient Greek, as in other ancient writing systems, the function of the alphabet was already constrained by the requirement of mathematics, because the twenty-four letters of the alphabet plus three additional alphanumeric signs (digamma, koppa, sampi) notated unspoken mathematical concepts based on the enneads of the Egyptian numerical system. In short, the twenty-seven Greek characters were part of a total semiotic universe of writing and reasoning that encompassed phonetic representation but went well beyond it.[22]

In ordinary parlance, "alphabet" is used interchangeably with "script" on the one hand and "writing system" on the other. It is helpful to maintain careful distinctions among these terms to avoid confusion when we discuss writing. For instance, when the Greeks adapted the conventional Phoenician Semitic consonantal alphabet and Cypriote syllabary to their spoken language, what they imported into Greek was not a writing system but foreign scripts out of which they created a new writing system. By Coulmas's definition, writing systems are language-specific whereas scripts typically are not—there have been far fewer scripts than writing systems in the world. A script may coincide with a single writing system,

such as the Korean phonetic script *Han'gul*, which is used for no other language, but the opposite is often true. The *Devanagari* script in India, to take an example, is used for a variety of languages, such as Hindi, Nepali, and Marathi. Alternatively, Hindi and Urdu are virtually the same spoken language, but Hindi is written in *Devanagari* whereas Urdu is written in Perso-Arabic script.[23] The (Chinese) square-block character script has been adopted to create a great variety of writing systems in Asia: Japanese, classical Korean, Vietnamese, among others, including some obsolete ones. The Roman alphabet, in the course of Christian evangelization and modern colonialism, has been adapted to numerous languages in Africa, Asia, and the Americas. For instance, the Wade-Giles system and, more recently, the *Pinyin* alphabet (with twenty-one consonants and fifteen vowels/diphthongs)—used to transcribe the phonemes of written Chinese characters for the purpose of standardized translation, school pedagogy, and, increasingly in our time, access to global "electracy" (literacy in electronic media), which is primarily coded in English—are not themselves writing systems but notational scripts based on the Roman alphabet.

From the viewpoint of biomechanic media, the dissemination of writing has been accompanied by an impressive variety of instruments of inscription, ranging from bones, shells, clay, bronzes, stone, papyrus, parchment, bamboo, silk, wood, brushes, quills, and ink, all the way to the invention of paper, print or typography, and chips for electronic processing. Different mediums have no doubt made their imprints on writing, reading, and bookmaking. Tsuen-Hsuin Tsien suggests that the predominantly downward strokes of written Chinese characters and the vertical, right to left, arrangement of lines have to do with the material and tools of writing before the invention of paper in China in 105 CE. The hand holding the writing brush (by a right-handed scribe) was constrained by the grain of bamboo and wood surfaces and by the narrow strips, which allowed only a single line of characters.[24] Likewise, Egyptian hieroglyphs, when chiseled on stone monuments, were carefully formed and decorative in shape when compared with writing on papyrus, which permitted cursive or hieratic forms to develop and accommodated rapid writing (Innis 1972, 16). Papyrus, parchment, and paper each gave rise to specific forms of manuscript culture that have greatly affected the forms of political organization in history.[25] Commenting on the Roman Empire, Innis suggests that "the written tradition dependent on papyrus and the roll supported an emphasis on centralized bureaucratic administration," whereas parchment as a medium in medieval Europe helped give the church a monopoly of knowledge through monasticism.[26] The ecclesiastical monopoly was greatly weakened by the introduction of paper and printing from China, which led to the rise of vernacular literatures and nationalism in Europe.[27]

The spread of Buddhism in China prompted the invention of woodblock printing early in the eighth century. Large-scale productions of printed books and their dissemination across Asia facilitated widespread socioeconomic transformations that would eventually sweep across the whole world. Movable type was invented in China in 1041–1048 CE.[28] Interestingly, besides the printing of Buddhist scripture, this technology was adopted in the printing of the earliest paper currency, within decades of the invention of paper money in China around this time, which suggests that the standardization and serialization of metal type also served the needs for the organization and control of early modern economy in Asia.[29] Following the introduction of paper manufacture to Europe, block prints also began to appear in European cities in the latter part of the fourteenth century as a result of the westward expansion of the Mongol Empire. The adaptability of the alphabet to movable type and large-scale machine industry translated gradually into the rise of universal literacy, newspapers, vernacular fiction, advertising, and new forms of trade and politics. Observing the tremendous effects of printing on the transformation of psychic and social life in Europe and elsewhere, Marshall McLuhan pointed out in *The Gutenberg Galaxy* that "the invention of typography confirmed and extended the new visual stress of applied knowledge, providing the first uniformly repeatable commodity, the first assembly-line, and the first mass-production."[30] The mechanization of scribal art introduced a new level of "repeatable precision that inspired totally new forms of extending social energies."[31] In English literature, as W. J. T. Mitchell demonstrates in *Picture Theory*, this typographic imagination gave rise to William Blake's innovative poetic idiom and "a visible language of graphic and typographic signifiers" (1994, 129).

Writing and its relation to visuality lie at the heart of a long-standing philosophical discourse on writing, scripts, language, representation, and truth in the West.[32] In *Phaedrus*, Plato's ambivalence about writing shows up in his distrust of visual arts in general and his fear that writing might supplant or destroy memory (which, not surprisingly, anticipated the kinds of anxieties that followed upon the introduction of print in fifteenth-century Europe and the personal computer in our time; the fantasy about downloading the human mind or memory into the computer resonates with that fear).[33] The accidental discovery of Egyptian hieroglyphs in the eighteenth century gave further impetus and a comparative spin to the discourse on visuality and writing as Europeans, in the course of colonial travel and exploration, became increasingly aware of the existence of archaic scripts and nonalphabetical writing.[34] From

then on, the history of writing began to assume an evolutionary guise or what Mitchell characterizes as "a story of progress from primitive picture-writing and gestural sign language to hieroglyphics to alphabetic writing 'proper'" (1994, 113). Thus, Jean-Jacques Rousseau hypothesized in *The Origin of Language* that "the depicting of objects is appropriate to a savage people; signs of words and of propositions, to a barbaric people, and the alphabet to civilized people."[35] Dr. Johnson called the Chinese "barbarians" on a sliding scale of evolutionary progress for the reason that "they have not an alphabet."[36] The superiority of the alphabet to pictographic, syllabic, and ideographic scripts is generally attributed to its unique ability to represent speech.[37]

This colonial, evolutionary theory of writing has posed numerous obstacles to a clear understanding of the relationship among visuality, writing, and language. Not only does it misrepresent nonalphabetical writing as a failure in the teleological march toward phoneticization, but it simultaneously obscures the process whereby alphabetic writing has evolved as an alphanumerical technology from antiquity to the rise of informatics. As we know, alphabetic letters are no less visual symbols than nonalphabetic writing but, compared with the latter, are much easier to learn and to reproduce. The linearity, simplicity, and analytical powers of alphabetical writing have facilitated its dissemination around the world, although the same phonetic function is also capable of suppressing the spatial, architectonic, and gestural dimensions of human communication. The modernist poet Ezra Pound saw the limitations and tried to mitigate them by incorporating nonalphabetic characters in his English verse. Depending on how one frames the issue and what social functions one expects writing to fulfill, there are advantages and limitations to both alphabetical and nonalphabetical forms of writing that need not be elaborated here. From the hindsight of informatics, the singular advantage enjoyed by alphabetical writing over nonalphabetic writing is the algorithmic potentials of alphabetic letters with respect to cryptography, machine, and mathematics, which overshadow its much touted power of phoneticization with respect to human communication. If the simplicity of phonetic representation were the telos of human communication, then literature, art, and rhetoric would have been superfluous to the making of civilizations, but the same simplicity greatly aided the invention of Morse code, informatics, and machine language, which we will discuss below.

Due to the ambiguous status of alphabetical letters with regard to phonetics and visuality, informatics and modern linguistics often proceed from very different theoretical assumptions about alphabet writing. Whereas algorithmic thinking revolves around the numerical or ideographic potentials of alphabetical writing, modern linguistic theory has inherited much of the phonocentrism of earlier European evolutionary theories. In the *Course in General Linguistics* (first published by his students in 1916), Ferdinand de Saussure inaugurated structural linguistics, formalizing a systematic approach to the study of language with an emphasis on synchronic structure. The linguistic sign, in his definition, consists of a signifier and a signified. The signifier is a discrete linguistic element, such as the sound unit known as the "phoneme," or a graphic image, but it primarily assumes the material aspect of the sign in the form of a sound image. The signified consists of a conceptual image or idea which is arbitrarily fixed onto the sound image, arbitrarily in the sense that no natural correspondence exists between sound and concept. The relation between signifier and signified and their relation to other signs within the system determine the differential value of each sign. According to Saussure, synchronic analysis can shed important light on the diachronic understanding of language change as well:

> Let there be no mistake about the meaning that we attach to the word 'change'. One might think that it deals especially with phonetic changes undergone by the signifier, or perhaps, changes in meaning which affect the signified concept. That view would be inadequate. Regardless of what the forces of change are, whether in isolation or in combination, they always result in a *shift in the relationship between the signified and the signifier*.[38]

This insight enabled Saussure to analyze linguistic meaning as a differential function of the signifier and the signified rather than as a result of natural correspondence between symbol and idea. This powerful explanatory model enabled the French anthropologist Claude Lévi-Strauss to launch structural anthropology, which would transform the discipline of anthropology in the West for several decades. In structural anthropology as in linguistics, speech is primary, suggesting immediacy, presence, identity, and authenticity, whereas writing, a secondary system of representation, figures deferment, absence, difference, and inauthenticity (even though Saussure was not unaware of instances of writing such as the rebus, the anagram, and the written letter). Derrida dubs the structuralist's preoccupation with phonetic inscription "logocentric" and discerns in its operation a supplementary logic that simultaneously excludes writing from the linguistic system and relies on alphabetical writing to enable phonemic analyses.[39]

But writing persists in spite of the linguistic sign. Jacques Lacan troubles the Saussurian sign by performing a psychoanalytical reading of the signifier in his famous seminar on Edgar Allen Poe's detective story "The Purloined Letter." He demonstrates that the stolen letter in the

story signifies and circulates among the various agents without the help of any particular signified. As a pure signifier, the letter's movement, displacement, and retrieval alone can support the full weight of a fictional drama about royal intrigues and detective interventions.[40] Poe, of course, had been fascinated by cryptographic code and other pure signifiers in his time. The central enigma of another of his celebrated stories, "The Gold-Bug," for example, presents itself as a textual problem: How to crack an unknown code to find the hidden treasure? Curiously, the code—handwritten on a piece of parchment—consists of not only familiar numerals, letters, and punctuation marks but typographical symbols (*, ¶, ‡, †, etc.) that would have been rare or nonexistent in manuscript (parchment) culture but are abundant in typography—which was the medium of Poe's story. Friedrich Kittler's contention that Lacan's theoretical apparatus was indebted to the evolution of modern media technologies might easily be extended to explain Poe, whose passion for typography and cryptoanalysis anticipated the arrival of information theory in our own time. For Lacan, the symbolic enjoys the status of typography, whereas the real and the imaginary correspond, respectively, to phonography and film (Kittler 1999, 18). In the other words, the typewriter, gramophone, and film provide the conceptual and technological framework within which Lacanian psychoanalysis begins to make sense. Kittler reminds us further that Nietzsche "changed from arguments to aphorisms, from thoughts to puns, from rhetoric to telegram style" when he became the first philosopher to use a typewriter (1999, 203).

Through print and electronic media, alphabetic writing has come to dominate the world of communication. McLuhan was quick to grasp the implications of this development and termed the phonetic alphabet a "cool and uniform visual medium" for good reason.[41] Intuitive reflections on the function of the phonetic alphabet seem to support the impression that letters stand for the sounds of speech. But what sounds? C. K. Ogden, the architect of BASIC English along with the literary critic I. A. Richards, once complained about the irregularities of phonetic representation in English, stating that "the vowels represent not 7 sounds but 54, the 26 letters of the alphabet giving a total of 107 values, or with the vowel digraphs ('each', 'ou', etc.) and multigraphs ('eau', etc.) 280." Compounding the burden of 280 sound values and their various combinatorial units are the statistical hurdles at the level of English vocabulary. "To distinguish all these in a vocabulary of 20,000 words, or even 2,000," says Ogden, "necessitates an amount of drudgery which has given phoneticians and advocates of synthetic languages their opportunity."[42]

Leaving aside the contested theory of which discrete units of speech or phonemes can phonetically be represented by which letters (as in the case of /ks/, written as one letter, *x*, in English), there is also the cognitive question of how the written code relates *meaningfully* to the linguistic image in the mind. In a cybernetic leap of faith, Norbert Wiener and his colleagues experimented with the idea of bypassing both hearing and vision so that deaf-mutes could arrive at instant comprehension of verbal signs through touch rather than gesture. Their experiment brings to mind Rousseau's description in *The Origin of Language* of how traders in India conducted business by taking each other by the hand, varying their grip in such a way as to perform secret transactions in public, unobserved by others and without uttering a single word.[43] That is to say, sight, hearing, and speech need not to be present for communication to take place. Wiener's experiment rested on a similar premise about communication, except that it also involved a translation of acoustic signals in the form of physical vibrations in the air, which, fed through a tactile device, would correspond to an experience of meaning in the receiver's mind.[44] Even so, Wiener's sensory prosthesis begs the question of how the tactile code relates to the conceptual processes in the mind.

Cryptography and information theory tried to get around the cognitive issue by working exclusively with alphanumerical symbols in a mathematical remapping of communication. Alan Turing and Claude Shannon uniformly took the printed letters of the English alphabet as their point of departure. Shannon, the inventor of information theory, approached English as a statistical system, which he termed "Printed English," and subjected alphabetic writing to algorithmic thinking and engineering on behalf of informatics. This peculiar English is composed of the twenty-six-letter alphabet (A to Z) plus a twenty-seventh letter that mathematically codes "space." In other words, Printed English is an ideographical alphabet with a definable statistical structure. As a postphonetic system, it functions as a conceptual interface between natural language and machine language. This postphonetic construct is predicated on the symbolic correspondences between the twenty-seven letters and their numeral counterparts in lieu of mapping the letters onto the phonemic units in the spoken language. The alphanumerical correspondence not only facilitates the encoding of messages in information systems but also enables a rethinking of the idea of communication. The centrality of printed symbol for technology has something to do with the fact that, to use Friedrich A. Kittler's words, "in contrast to the flow of handwriting, we now have discrete elements separated by spaces" (1999, 16). The "space" symbol in Printed English is a conceptual figure, not a visible word divider as is commonly observed in some writing systems. The sign may show up as a negative value or as the visible absence of letters, but the twenty-seventh letter is just as likely to be mathematically

represented by "o" as by one or two types of electric pulse on a transmission system. This letter owes its existence to the statistical, rather than visual or phonemic, parameters of symbols. It has no linguistic meaning insofar as conventional semantics is concerned but it is fully functional as a meaningful ideographical notion.

Nietzsche made a prescient remark in 1878: "The press, the machine, the railway, the telegraph are premises whose thousand-year conclusion no one has yet dared to draw."[45] As one of the most significant inventions since World War II, Printed English is a direct offspring of telegraphy because it is based on a close analysis of Morse code conducted by Shannon himself. In his pathbreaking essay "A Mathematical Theory of Communication" published in the *Bell System Technical Journal* 1948, Shannon laid the statistical foundation of information theory. Two years later, he published another article called "Prediction and Entropy of Printed English," which further elaborated the experimental work in connection with his earlier work. These studies suggest numerous connections with Shannon's code work in World War II, when he had investigated the statistical aspects of alphabetic writing in cryptoanalysis and helped design secrecy systems at Bell Laboratories for the U.S. military. As a discrete, ideographic symbol, Shannon's twenty-seventh letter is meaningful precisely in this cryptographic sense. As if mirroring cryptography, Printed English has a corresponding, translated text in numerical symbols. The original text "with an alphabet of 27 symbols, A, B, . . . Z, space, has been translated into a new language with the alphabet 1, 2, . . . 27."[46] This conception lays the theoretical foundation for what would become digital technology in computer science. Through a built-in mechanism of alpha-numerical translation, Printed English achieves its ultimate ideographic embodiment in the mathematical figuring of o/1 binary oppositions.[47]

In our time, the alphabet seems more thoroughly and universally digital than it has been. Be it word processing, digital imaging, genetic engineering, interactive games, or simulated and actual warfare, we are living in the midst of a digital revolution that is dissolving older conceptual boundaries and introducing new ones. Digital media transform contemporary civilization by turning one of the oldest technologies—alphabetic writing—into a universal coding system to unlock the mind and the secret of life itself (see chapter 8, "Biomedia"). It seems that the spatial/temporal coordinates of our future cognitive world will evolve into ever intensified interdependence of human and machine or similar kinds of prosthetic conditions enabled by digital media. But as Mitchell's discussion of image and media in chapter 3 suggests, "digital imaging may be uncovering yet another layer of the perceptible cognitive world that we will recognize as having always been there." Indeed, the numerical function of the alphabet has been there since antiquity, and yet we are so used to thinking of alphabetic writing as a phonetic system of transcription that Shannon's treatment of the English alphabet as a total ideographic (algorithmic) system may still come as a shock. At the same time, digital technology is converting nonalphabetic writing systems such as Chinese into a kind of subcode of global English. Once again, a tower of Babel is being erected on the promised land of universal communicability, machine translation (MT), or machine-aided translation (MAT), a dream that is forever haunted by the memories of a not so distant oracle.

Notes

1. The six-dot matrix within which characters are differentiated in Braille is a formal mechanism that relies on spatial rather than visual arrangement. For a discussion of writing as the organization of graphic space, see Harris, *Signs of Writing* (1995, 45).

2. TTS, a branch of artificial intelligence, is one of the areas where the relationship between writing and speech can be fruitfully investigated for both engineering and theoretical purposes. See Richard Sproat, *A Computational Theory of Writing Systems* (Cambridge: Cambridge University Press, 2000).

3. The shared Chinese and Japanese *kanji* word *wenming* ("civilization"; literally, "illumination through text"), with its positive emphasis on *wen* or "text/textuality," brings out the etymology of writing more forcefully than the Latin equivalent. *civilis*.

4. For helpful reference on the subject, see Jack Goody, *The Domestication of the Savage Mind* (Cambridge: Cambridge University Press, 1977).

5. For example, Jacques Derrida discerns an inherent ethnocentrism in anthropological discourse on writing in his reading of "A Writing Lesson" by Lévi-Strauss in which the latter describes his fieldwork among the "innocent" Nambikwara tribe. See "The Violence of the Letter: From Lévi-Strauss to Rousseau" in Derrida, *Of Grammatology*, trans. Gayatri Chakravorty Spivak (Baltimore: The Johns Hopkins University Press, 1971), pp.101–40.

6. The Phoenicians are often credited as the inventors of the alphabet. M. O'Connor argues, however, that "the Phoenicians did not 'invent' the alphabet. A variety of scripts (and peoples) were involved in the diffusion of the alphabet around the region, even if the Phoenicians played a major role in the process." See Peter T. Daniels and William Bright, eds., *The World's Writing Systems* (Oxford: Oxford University Press, 1996), 96.

7. A vocabulary of more than four thousand written characters and/or words has been brought to light by archaeologists. These were inscribed on the oracle bones used by the royal houses for divination and are regarded as the royal archives of the period. Only about half of the characters have been successfully decoded thus far. From the evidence of these oracle bone inscriptions, it is clear that the earliest beginnings of Chinese writing go much further back, but there is considerable controversy over the dates due to the lack of direct archaeological evidence. Much of this controversy also hinges on how one views writing. Recently, the journal *Antiquity* published a field report by archaeologist Li Xueqin and his Chinese and American collaborators, who speculate tentatively that the antiquity of Chinese writing might be dated to the seventh millennium BCE. Li Xueqin et al. "The Earliest Writing? Sign Use in the Seventh Millennium BC at Jiahu, Henan Province, China," *Antiquity*