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Lingua ex Machina: Computer-Mediated Communication and the Tower of Babel

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We've finally reversed the damage done by the Tower of Babel, and God, no doubt, is wondering what we're going to do for an encore.[1]

The "Tower of Babel" (Genesis 11:1-9) provides an account of the plurality of languages as having issued from an original and apparently universal tongue. The first line of the fable reads: "And all the earth was one lip and there was one language to all." This mythic loss of an original universality and the subsequent attempts to reestablish it by overcoming the *confusio linguarum* already constitute a kind of universal idiom: "The story of the confusion of tongues, and of the attempt to redeem its loss through the rediscovery or invention of a language common to all humanity, can be found in every culture."[2] The computer and the technologies of computer-mediated communication manifest the most recent version of this supposedly universal endeavor. According to numerous popular and technical discourses, the computer promises to supply a technological solution to the linguistic cacophony that has been the legacy of Babel. In this manner, computer technology participates in an old and apparently universal obsession, one that situates universality as both its origin and its purpose. **[End Page 61]**

In this paper I will undertake an examination of the Babelian information that currently circulates through cyberculture and determines the general significance of networked computer systems. I will trace the origin and purpose of the desire for universal understandability, locate the computer within this tradition, and ask about the underlying assumptions and consequences of this procedure. My inquiry is directed toward not only computer technology per se, but also the various discourses that have reflected on and informed the meaning of this technology. In short, I attempt to understand the rather cacophonous babble concerning Babel as it has been deployed within the networks of computer-mediated communication. Whether this babble derives from and is reducible to a single and univocal meaning cannot be answered in advance--for this question constitutes the very issue that will be at stake in the "Tower of Babel."

Introduction

In the popular mythology the computer is a mathematics machine; it is designed to do numerical calculations. Yet it is really a language machine; its fundamental power lies in its ability to manipulate linguistic tokens--symbols to which meaning has been assigned.[3]

Although its taxonomy is derived from a mathematical concept, the computer is not primarily a computational apparatus. Its substance and genealogy have been determined to be otherwise. Michael Heim, the self-proclaimed metaphysician of cyberspace technology, traces the genesis of the computer to the universal-language movement: "Underneath the computer's calculating power lies an inner core sprung from a seed planted two centuries ago. . . . That initial germ for the birth of computers started with the rationalist philosophers of the seventeenth century who were passionate in their efforts to design a world language."[4] Seventeenth-century Europe saw the development of several projects related to the creation of a universal idiom. In a 1657 publication, for example, Cave Beck proposed a *Universal Character, by which all the nations of the world may understand one another's conceptions, reading out of one common writing their own mother tongues*. A similar pasigraphic endeavor was undertaken by Athanasius Kircher in the *Polygraphia nova et universalis ex combinatoria arte detecta*, which proposed a system of writing in **[End Page 62]** which "all languages are reduced to one." Five years earlier, Francis Lodwick published *The Groundwork or Foundation Laid (or So Intended) for the Framing of a New Perfect Language and a Universal Common Writing*, which proposed not only a universal idiom to which everyone would have equal access, but also a perfected language that was "capable of mirroring the true nature of objects."[5] Similar systems were introduced in the *Via lucis* (1668) of Comenius, George Dalgarno's *Ars signorum* (1661), and John Wilkins's *Essay toward a Real Character and a Philosophical Language* (1668).

The seventeenth-century philosopher to whom the computer makes particular reference, however, is Gottfried Wilhelm von Leibniz. According to Michael Heim, "Leibniz's general outlook on language became the ideological basis for computer-mediated telecommunications."[6] This privileged status was established by Norbert Wiener more than forty years ago in the introduction to the text that originated the science of cybernetics: "If I were to choose a patron saint for cybernetics out of the history of science, I should have to choose Leibniz. The philosophy of Leibniz centers about two closely related concepts--that of a universal symbolism and that of a calculus of reasoning."[7] The significance and interrelationship of these two concepts was summarized by Leibniz in a 1679 missive to the Duke of Hannover, which addressed the invention of an artificial, philosophical language:

> For my invention uses reason in its entirety and is, in addition, a judge of controversies, an interpreter of notions, a balance of probabilities, a compass which will guide us over the ocean of experiences, an inventory of all things, a table of thoughts, a microscope for scrutinizing present things, a telescope for predicting distant things, a general calculus, an innocent magic, a non-chimerical Kabal, a script which all will read in their own language; and even a language which one will be able to learn in a few weeks, and which will soon be accepted amidst the world.[8]

The proposed invention would accomplish two goals: it would provide a thoroughly rational protocol whereby all debate and controversy would be resolved through calculation, and it would establish a universal writing that would be acceptable to all nations and cultures. These two operations are necessarily interrelated. The rational **[End Page 63]** perfection of the idiom ensured that the new system of writing was not arbitrary and ambiguous like the "natural languages." Rather, this *characteristica universalis* was substantiated by, and resided in perfect concord with, reason. It was therefore suited to all particular members of the genus that European philosophy had defined as *animale rationale*. Leibniz's rational calculus would thus be capable of overcoming the *confusio linguarum* once and for all, for it "would compile all human culture, bringing every natural language into a single shared database."[9]

In canonizing Leibniz as the patron of the new science of communication and control, Wiener encoded this dream of a universal and perfect language into the fundamental program (or operating system) of computer technology. According to Wiener's estimations, "Leibniz's *calculus ratiocinator* contained the seed of the *machina ratiocinatrix*"--the reasoning machine, or computer.[10] Universal language, then, is not a project to which the computer has been applied; rather, it constitutes the very genetic structure and fundamental program of the technology itself. For this reason, information technologies, as such, have been determined to supply a universal idiom that restores the earth to the millennial conditions that were allegedly ruined at Babel. Bruce Schuman's *Utopian Computer Networking* provides a rather explicit articulation of this promise:

> The fabulous resources of human knowledge and wisdom can be combined through modern information science technology, to create the most authoritative voice for spiritual truth and insight which has ever existed on this planet. The vast resources of illumination and enlightenment which have been released to the human community in a flood of valuable and unquestionably authentic but somewhat diverse and competing metaphysical, philosophic, theological, and religious literature from all corners of the world, East and West, can be gathered up by methods of systematic scholarship, organized by underlying thematic invariants, conceptually recoded into a uniform and unified analytic/conceptual language--and made into a single towering "lighthouse of hope" that can illuminate for the entire world the true spiritual path back to harmony and freedom and love.[11]

The computer is understood as a machine of language. Not only does its fundamental power reside in its ability to manipulate linguistic **[End Page 64]** tokens, but its very substance has been in-formed by the Babelian dream of linguistic universality. The computer, therefore, constitutes a "universal machine" not only because it is capable of simulating the function of any machine, but also because it promises to provide the very means of universal communication and concourse. For this reason, it has served as the platform for applications that promise to deliver practical solutions to the *confusio linguarum* that is the legacy of Babel--applications that include efforts at machine translation and postlinguistic communication.

Machine Translation

> Students of languages and of the structure of languages, the logicians who design computers, the electronic engineers who build and run them--and specifically the rare individuals who share all of these talents and insights--are now engaged in erecting a new Tower of Anti-Babel. This new tower is not intended to reach to Heaven. But it is hoped that it will build part of the way back to that mythical situation of simplicity and power when men could communicate freely together. [12]

In narrating the beginnings of linguistic difference, the story of the Tower of Babel provides an account of the origin of translation--literally, the carrying across from one language into another. Mechanized translation seeks to automate this process by designing technologies that translate one language into another with little or no human interaction. The prospect of immediate, automated translation is as old as the first electronic data processors, and efforts to produce computerized translators have led to the development of a distinct discipline called *machine translation* (MT). [13] According to Muriel Vasconcellos, president of the Association of Machine Translation in the Americas, the discipline of MT has been developed in direct response to the Babelian legacy: "If you can't conquer Babel, at least, thanks to MT, you can have a better idea of the knowledge that's **[End Page 65]** available in the world and how you can tap into it." [14] Machine translation endeavors to design software, or what is called "Babelware," [15] that provides automatic, interlingual translation. The first text-based systems were developed in the early 1950s and employed the processing and memory power of the mainframe; in the early 1980s, MT systems began to migrate to the desktop PC.

Although many MT systems are organized around restricted language sets, the ultimate goal has always been *universal translation* of unrestricted language, or what Erwin Reifler called *general* MT. [16] The universal translator would do more than mitigate the disparity between two (or even multiple) languages: it would overcome the confusion instituted at Babel by translating any language into and out of every other language, automatically and simultaneously. The universal translator, then, aspires to nothing less than a technologically enabled Pentecost. This objective has been articulated by the "patron saint" of the telematic world, Marshall McLuhan, in *Understanding Media:* [17] "Language as the technology of human extension, whose powers of separation we know so well, may have been the 'Tower of Babel' by which men sought to scale the highest heavens. Today computers hold out the promise of a means of instant translation of any code or language into any other code or language. The computer promises by technology a Pentecostal condition of universal understanding and unity." [18]

For McLuhan, the "Tower of Babel" is correlative with the technology of language itself. Language embodies the promise of universal connectivity and cooperation but has been experienced as an agent of separation. The apocalypse of this linguistic segregation is achieved at Pentecost, which is described in the second chapter of the Acts of the Apostles. After receiving the gift of the holy spirit, the Apostles left their room and began speaking in the streets. As they spoke, everyone heard the word of God in his or her native language. "**[End Page 66]** And the people were amazed and marveled saying: 'Are not all these men who are speaking Galileans? How is it that each of us hears them in our own language to which we were born?'" [19] Pentecost marks the overcoming of Babelian confusion through real-time, interlingual translations. The Apostles, while speaking their own native language, are immediately understood by everyone in whatever language constitutes their native tongue. In this way, Pentecost reestablishes universal understanding between human agents despite differences in their means of communication.

The computer promises to become the technological equivalent of this miracle, providing the "means of instant translation of any code or language into any other code or language." Although this Pentecostal operation remains beyond the scope of contemporary MT efforts, it constitutes the goal and has determined the general trajectory of the discipline. According to Vasconcellos, "the dream is to build the equivalent of the babblefish [*sic*] [20] of Douglas Adams' book *The Hitchhiker's Guide to the Galaxy*--a wearable device that simultaneously interprets from and into any language of the world." [21] According to *The Hitchhiker's Guide*, a title that names both a novel by Douglas Adams and an encyclopedic text cited within this novel, the Babel fish is a small, leech-like parasite that resides in the auditory canal of the ear: "The practical upshot of all this is that if you stick a Babel fish in your ear you can instantly understand anything said to you in any form of language."[22] The Babel fish, therefore, reproduces the miracle of Pentecost for its host by providing flawless, real-time translations from all languages. [23] **[End Page 67]**

General translation systems, although currently associated with computer technology, were proposed as early as the seventeenth century. In many of the pasigraphic projects of the 1600s, the proposed *characteristica universalis* constituted not a universal language per se, but a translation protocol into which and from which any natural language could be translated. Athanasius Kircher's *Polygraphy* (1663), for instance, proposed a technique of writing whereby "anyone, even someone who knows nothing other than his own vernacular, will be able to correspond and exchange letters with anybody else, of whatever their nationality." [24] In order to accomplish this task, Kircher proposed two translation tools: dictionary A, by which one was able to *write* in any unknown language, and dictionary B, by which one could *understand* a text written in an unknown language. [25] Strictly speaking, Kircher's *Polygraphy* is not a universal language, but a technique of general translation capable of negotiating **[End Page 68]** the difference between languages. Similar translation systems were proposed in Cave Beck's *Universal Character, by which all the nations of the world may understand one another's conceptions, reading out of one common writing their own mother tongues* (1657), Joachim Becher's *Character pro notitia linguarum universali* (1661), and Gaspar Schott's *Technica curiosa* (1664). Recent studies in machine translation, like Luigi Heilmann's "J. J. Becher: Un precursore della traduzione meccanica" and W. John Hutchins's *Machine Translation: Past, Present, Future* (see especially chapter 2), have recognized these seventeenth-century projects as the precursors to contemporary efforts in MT. [26]

Despite the rather ambitious aspiration of universal translation, most contemporary MT products have been developed around language pairs and are limited, therefore, to mediating between two predetermined language sets--for example, Systran (English/Russian, English/French, English/German), Météo (English/French), CITEC (Chinese/English), PENSEE (Japanese/English), and Globalink GTS series (Spanish/English). [27] In these systems, which Erwin Reifler termed *specific* MT, [28] translation is accomplished through a transfer module that directly links the two languages through a series of steps specific to that language pair. Specific translation systems, although capable of providing an acceptable output, experience significant complications when applied to more than two languages. For *n* languages, this systems-architecture requires *n*(*n*-1) transfer modules; consequently, an MT system for the nine official languages of the European Community would require seventy-two separate translation modules. To address this limitation, which affects not only translation efficiency but, more importantly, its expense, several multilingual systems have been designed employing a third, intermediate language, or interlingua. As Klaus Schubert explains: "the *n*(*n*-1) formula is based on the assumption that every source language is linked directly with every target language. If these direct links can be given up in favour of a single, central representation, the combinatorial problem is removed." [29] For *n* languages, this **[End Page 69]** alternative systems-architecture requires only 2*n* translation modules; consequently, a translation system for the nine official languages of the European community would require eighteen transfer modules, each language having its own protocols for translating into and out of the interlingua. Interlinguas can be either natural languages that have been chosen for convenience as an intermediary, or artificial languages that have been invented for the purposes of mediating linguistic difference. Donald Booth, Leonard Brandwood, and John P. Cleave, for example, advocate the use of a natural language such as English, arguing, on the basis of economics, that such translation systems would require not 2*n* transfer modules but 2*n*-2. [30] Ivan Guzmán de Rosas has suggested the use of Aymara, which Emeterio Villamil de Rada (1860) argued was the protolanguage spoken by Adam. [31] BSO's (Buro voor Systeemontwikkeling) DLT (Distributa Lingvo-Tradukado) system employs the artificial language of Esperanto, arguing that this idiom combines the expressiveness necessary for translating natural languages with the extreme clarity of an artificial symbolic system necessary for automated processing. Other artificial-language-based systems have been proposed by Carnegie Mellon University's Center for Machine Translation, [32] Bell Labs, and NEC. And some rather speculative schemes have suggested employing Klingon, the fictional language developed for *Star Trek* and the most popular artificial language currently in use. [33]

Although the use of an interlingua overcomes the limitations of combination in multilanguage MT systems, these intermediaries have a distinct limitation: in relying on either a specific natural language or an artificial one, the intermediary is set up a posteriori. That is, the language that is supposed to mediate between all other languages is either one of those languages, or an artificial idiom that is derived from empirical research on a specific natural language or set of natural languages; in either case, the interlingua is neither universal nor equally accessible to everyone. The translation system would privilege certain users, restricting all possible expressions to concepts and logics that are germane to that particular idiom. Esperanto, for example, although formulated as a universal, international **[End Page 70]** language, privileges native speakers of the European languages from which Esperanto has derived its grammar, vocabulary, and alphabet. The a posteriori interlingua, whether it is comprised of a natural or artificial language, is limited by the ethnocentrism of the specific language(s) from which it is derived. Although universal translation or general MT could be based on such a systems-architecture, these systems would be neither universal nor general.

General or universal translation, in order to be truly general and universal, would require an interlingua that is not derived empirically from one or more natural languages, but that is instead an a priori intermediary, "a universal translation programme applicable to all languages." [34] Yehoshua Bar-Hillel acknowledged this requirement in his 1951 report on the state of MT research: "Whereas specific MT will, in all probability, continue to be mainly an application of trial-and-error investigations, general MT will require establishment of a *universal,* or at least *general grammar*." [35] Bar-Hillel recognized that this undertaking was directly connected to and dependent upon the seventeenth-century projects of universal language. Most proposals for a *characteristica universalis* or *grammatica universalis* proceed by first developing a list of primitive concepts that are assumed to be universal for all human cognition and transcendent of variation in linguistic expression. The *Real Character* of John Wilkins, for example, was grounded in a list of concepts that, he argued, had been derived not from one language but from the stock of concepts held in common by humanity. The foundation of Ramón Lull's *Ars combinatoria* was a list of ideal entities that he collected in the *Tabula generalis*, and the *characteristica universalis* proposed by Leibniz was grounded in an inventory of irreducible and universal primitives from which all expressions in any language could be generated. The development of general MT has proceeded in a similar fashion. Although researchers have generally rejected the universal-language projects of the seventeenth century as naïve and unscientific, they have not rejected the fundamental concept of linguistic universals. Bar-Hillel, for instance, does not reject the concept of universal grammar *tout court*; rather, he rejects prior attempts to establish this universality through "metaphysical preconceptions and Aristotelian logic," and as an alternative, he suggests formulating the universal character of general MT on scientific grounds--namely, **[End Page 71]** "empirical open-mindedness, mathematical logic and modern structural linguistics." [36] Following Bar-Hillel's suggestion, the discipline of MT has allied itself not with metaphysics but with linguistics and cognitive science. For this reason, the universal character proposed by machine translation lies not in a list of primary metaphysical entities but in the universal, deep structures of the linguistic faculty or the fundamental, general operation of human cognition.

In grounding universal translation either in a list of universal entities, as proposed by the universal-language projects of the seventeenth century, or in linguistic universals, as proposed by contemporary science, general MT makes an assumption about the nature of language that is as ancient as Babel: it assumes that linguistic differentiation is not irreducible, but is derived from and subtended by a primordial universality and unity. This assumption has been a constitutive component of the discipline of MT from its inception. The application of computer technology to translation was initially suggested in a memorandum written by Warren Weaver, vice-president of the Rockefeller Foundation. In this short but influential text, which according to Hutchins "in effect . . . launched machine translation as a scientific enterprise in the United States and subsequently elsewhere," [37] Weaver employed Babelian imagery to suggest that translation procedures be founded in the common, universal root of the natural languages:

> Think, by analogy, of individuals living in a series of tall closed towers, all erected over a common foundation. When they try to communicate with one another, they shout back and forth, each from his own closed tower. It is difficult to make the sound penetrate even the nearest towers, and communication proceeds very poorly indeed. But, when an individual goes down his tower, he finds himself in a great open basement, common to all the towers. Here he establishes easy and useful communication with the persons who have also descended from their towers. Thus may it be true that the way to translate . . . is not to attempt the direct route, shouting from tower to tower. Perhaps the way is to descend, from each language, down to the common base of human communication--the real but as yet undiscovered universal language. [38]

Weaver's post-Babelian narrative addresses not the *origin* of linguistic diversity, but its possible resolution and remedy. He tells of a multiplicity of individual towers that indicate the isolation and incompatibility **[End Page 72]** of each language. This diversity, however, is subtended by a common, universal substructure. For Weaver, this universal element is not a single tower situated on the Plain at Senaar, but a foundation upon which each differentiated tower has been constructed. Although there has been debate within the discipline of MT as to the true nature of this universal foundation, the field has generally accepted and operated within the basic structure of this architectonic.

The assumption of linguistic universality that has directed the efforts of general MT has two complications. First, despite the traditional reading of the Babelian narrative, linguistic variation is not necessarily derived from or subtended by a universal substrate--whether that be an original protolanguage, universal grammar, or common cognitive capability. These formulations of linguistic variation have been informed by a metaphysics that comprehends diversity, in either form or number, as not only derived from an original unity but destined for reintegration into the same. From the story of the *symbolon* told by Aristophanes in Plato's *Symposium,* through the eschatology of Scholastic onto-theology, to Hegel's *Science of Logic*, Western metaphysics has generally conceived of diversity as derived from and directed toward an original unity and self-same identity. As James Bono explains it, "unity becomes the very ground for the possibility of diversity; and the diversity of natural forms becomes the occasion for the quest for an original unity." [39]

This presumption of "unity within diversity," however, has recently been submitted to reevaluation. Jacques Derrida, for example, following the work of Georges Bataille, has espoused the concept of heterology. [40] This alternative formulation of diversity differs from that of the metaphysical tradition in that it comprises "an irreducible plurality that ceaselessly differs from itself." [41] As such, it constitutes a fundamental variation that not only suspends the assumption of an original unity and self-same homogeneity but also resists any and all eschatological promises of returning to the same. The consequences of this heterology for the theory and practice of translation are explicated by Derrida in "Des Tours de Babel," an essay about translation that was written for translation, but that nevertheless resists translation. In this reading of the Babelian narrative, **[End Page 73]** Derrida suggests that linguistic variation is not the result of some catastrophic fragmentation of an original and essential totality, but an irreducible and fundamental multiplicity of idioms that always already resists any and all attempts at totality: "The 'tower of Babel' does not figure merely the irreducible multiplicity of tongues; it exhibits an incompletion, the impossibility of finishing, of totalizing, of saturating, of completing something on the order of edification, architectural construction, system and architectonics." [42] According to the Derridean reading, linguistic variation is not a mere empirical problem to be overcome by some perfect translation or by return to a universal idiom, but a fundamental heterological variation within languages that renders translation an interminable task that is both necessary and impossible.

Similar conclusions have been generated from experimental research in the field of MT. Since its optimistic beginnings in the late 1940s, machine translation has experienced significant setbacks and failures. According to W. John Hutchins and Harold Somers, the reality of machine translation has not lived up to its initial dreams: "There are no 'translating machines' which, at the touch of a few buttons, can take any text in any language and produce a perfect translation in any other language without human intervention or assistance. That is an ideal for the distant future, if it is even achievable in principle, which many doubt." [43] The failures that have been experienced in MT research have not only led the discipline to pursue less-ambitious goals--namely, specific MT of restricted text, or machine-assisted translation tools--but have also motivated researchers to question the basic assumptions that had initiated and informed the discipline in the first place. [44] Alan Melby's *The Possibility of Language* undertakes a critical investigation of these "failures" in order to suggest new possibilities for reorganizing and reorienting the discipline. According to his assessment, MT has experienced significant complications and failures not because of technological limitations or imprecise modeling, but because of a fundamental misunderstanding of the object and supposed objectivity of languages. [45] **[End Page 74]**

The second complication is that, even if one denies these complications and accepts the traditional reading of Babel without question, machine translation is still faced with a rather curious paradox. On the one hand, general MT, as it has been formulated by the discipline, is possible only if there is some kind of universal characteristic or general grammar that transcends and substantiates specific linguistic variation. However, if there *is* such a universal character, translation becomes ultimately obsolete and superfluous. Why, for example, would anyone bother with the difficulties of translating natural languages into and out of a universal medium of exchange, when it would be far more efficient to employ the universal character directly? On the other hand, if general MT is not possible because of the lack of any universal characteristic transcending linguistic variation, then translation is absolutely necessary for there would be no other way to negotiate linguistic diversity. Ironically, universal MT is possible only if it is ultimately superfluous, and necessary only if it is fundamentally impossible. In the end, machine translation, like the Babelian narrative that informs its efforts, recounts "the necessary and impossible task of translation, its necessity *as* impossibility." [46]

Postlinguistic Communication

> Just as all men have not the same writing so all men have not the same speech sounds, but mental experiences, of which these are the primary symbols, are the same for all, as also are those things of which our experiences are the images. [47]

The Aristotelian formulation proposes that while the materials of language are manifold and differentiated, the animating thought, as well as the experience of the things of which these thoughts are images, remains universal and unique. The logical sequel to translation endeavors, therefore, would involve a transcendence of the material of translation, namely language, by a kind of communicative interaction that is located in this universal, metalinguistic element. "The next logical step," according to McLuhan, "would seem to be, not to translate, but to by-pass languages." [48] This next step would circumvent the confusion of tongues and the complications of translation, situating communication in either of the homologous elements that **[End Page 75]** have been determined to subtend and transcend linguistic difference. In this way, communication would be situated either in a neurological telecommunications system where minds are directly wired into other minds, which McLuhan has called "a general cosmic consciousness," [49] or in an immediate manipulation of the things themselves, which Virtual Reality pioneer Jaron Lanier has dubbed "post-symbolic communication." [50]

McLuhan's formulation of a "general cosmic consciousness" is informed by the Scholastic tradition, which traces its roots to Aristotelian philosophy. The concept is directly associated with the "collective unconscious" of Henri Bergson's *Creative Evolution* and approximates the noosphere proposed by Pierre Teilhard de Chardin in *Phenomenon of Man.* The noosphere, according to McLuhan's *Gutenberg Galaxy*, consists in a "cosmic membrane that has been snapped around the globe by the electric dilation of our various senses." [51] This worldwide, electric membrane constitutes a "technological brain for the world," [52] and the entire earth itself becomes a single mind/computer. In this global world-brain network, speech becomes obsolete and, with the passing of this principle of human division, the earth once again beholds the promise of universal harmony: "The condition of 'weightlessness,' that biologists say promises a physical immortality, may be paralleled by the condition of speechlessness that could confer a perpetuity of collective harmony and peace." [53] Such speechless communication approximates "angelic speech" as described by Thomas Aquinas in the *Summa Theologica* (Q.CVII A.2): "For one angel to speak to another angel means nothing else but that by his own will he directs his mental concept in such a way that it becomes known to the other." [54] The global net would provide a conduit for this kind of direct intellectual interaction. In this network, interlocutors would converse by directly communicating their thoughts to one another, avoiding once and for all **[End Page 76]** the complications that have been associated with language since the Babelian confusion.

The concept of speechless, direct neurological interaction, which is rooted in Scholastic philosophy, has been uploaded into the network of cyberculture by the novel that introduced the neologism "cyberspace," William Gibson's *Neuromancer*. Gibson's protagonist, the console cowboy Case, interacts with the global matrix and the world of information by directly jacking his consciousness into the network through surgically implanted "Sendai dermatrodes." [55] Case does not require any of the interfaces we commonly associate with computer-mediated communication (keyboards, mice, headphones, monitors, etc.); rather, his disembodied consciousness is directly wired into the neuroelectric fabric of the global network. [56] In the cyberspatial matrix, he is said to communicate at the level and speed of thought itself. This ideal cybernaut is no longer encumbered by the "meat" of the body, [57] just as his communicative interactions are no longer burdened with the materiality of language. Since the publication of *Neuromancer*, "the desire to have one's brain patched directly into cyberspace" has been not only a staple of cyberpunk fiction, [58] but the promise of contemporary telematic technology. A recent television advertisement for MCI (1997), for example, promotes the Internet as a utopian environment in which users are liberated from the problematic constraints of embodiment (i.e., gender, race, age, etc.), communicating with each other "mind to mind." **[End Page 77]** The possibility of technologically enabled "angelic speech" not only promises to repair the cacophony of language experienced in the wake of Babel but also, like the Tower itself, both approaches and threatens the heavens.

This kind of computer-mediated mind-to-mind connection is facilitated by brain-computer interface (BCI) technologies. Currently there are two possible BCI methodologies: electroencephalogram (EEG) monitoring, and implanted electrodes. The EEG interface schemes employ systems that detect brain waves, trace changes in the waveform, and interpret these changes as commands for computer functions. Initial work in this area was undertaken by the U.S. Air Force as part of the "Pilot's Associate" project. One element of this five-part system was something the Air Force called *biocybernetics*, which was "research aimed at developing better communication, even integration between computers and humans." [59] The Air Force's biocybernetics program sought to employ EEG monitoring both to track pilots' mind-states and to control aircraft functions. Although the program was canceled in the late 1970s, research in EEG monitoring and control systems continues at the Naval Health Research Center's Cognitive Psychophysiology Laboratory, which studies "links between human cognition and psychophysiology, principally EEG and eye movements, to develop neural human-system interface (NHSI) technology." [60] Additional EEG interface systems have been developed by the Department of Psychology and Cognitive Psychophysiology at the University of Illinois, [61] and have been demonstrated in cursor control systems [62] and computer communication devices for handicapped users. [63]

EEG-based systems, however, have two fundamental limitations that render them impractical for the proposed direct mind-to-mind communication. First, they are monodirectional: they "have no possibility **[End Page 78]** of input to the brain." [64] Although the changes in an EEG can be interpreted to control various computer functions, the computer cannot in turn influence brain waves in order to communicate with the user. EEG interfacing, therefore, holds more promise for the control of prosthetics than it does for communicative interaction. Second, the range of control provided by the EEG form of BCI remains extremely limited: "Although leading researcher Jonathan Wolpaw has commented that 'in theory the brain's intentions should be discernible in the spontaneous EEG,' the sheer complexity of the brain's measurable activity produces EEG traces which present a formidable problem of interpretation." [65] According to Andrew Pollack, "it is a major challenge to recognize from brain waves whether a person means 'yes' or 'no,' let alone to understand complex thoughts." [66] For this reason, all contemporary EEG interface systems have been restricted to highly specific tasks, such as the movement of a cursor on a monitor screen [67] or the selection of an element from a number of preprogrammed options. [68] In the end, the EEG interface does not circumvent the problem of language, interpretation, or translation--it merely relocates it. "It's difficult enough to have a speech recognition device, but there you know the language. . . . With EEG signals, we really don't know the language the brain uses." [69]

The second brain-computer interface schema is more in line with the imagery of contemporary science fiction, taking the form of electrodes implanted directly into the user's neurological system. The main advantage of implanted electrodes over the EEG BCI is that it permits bidirectional communication. Although this option is still considered science fiction, advances in electrode-configuration design **[End Page 79]** show some promise. Researchers at Stanford University, for example, have developed a "microelectrode array capable of recording from and stimulating peripheral nerves." [70] And a team at the Max Planck Institute for Biochemistry, under the direction of Peter Fromherz, has developed a silicon-neuron circuit that makes it possible to "write to and read from individual cells." [71] Theoretically, implanted electrodes would facilitate direct, bidirectional communication not only between neurological systems and the computer, but between different neurological systems wired into a common computer network. This bidirectional communication system, however, is still confronted with the complications of language: in order for the computer to read from and write to the brain, the system would first need to understand and manipulate what John von Neumann called "the language of the brain." [72] This "language"--which has also been called the "language of thought," [73] "neural code," [74] "brain program," [75] and "representation system" [76] --constitutes a language before and beyond the natural languages. The implanted-electrode BCI, therefore, does not, properly speaking, transcend language or the complications of linguistic variation; rather, it extends the *confusio linguarum* from the macrostructure of the organism to the microstructure of the neuron. In this way we are not, as John Young indicates by reference to Fredric Jameson, really escaping the "prison-house of language," but are as it were enlarging it. [77]

Jaron Lanier argues that Virtual Reality, like the direct neurological interaction initially described by McLuhan and exhibited within **[End Page 80]** the discourse of contemporary science fiction, promotes a communicative system that will eventually render language an obsolete technology. The malleable, synthetic sensorium of Virtual Reality promotes what Lanier calls "post-symbolic communication." This concept was initially explained in a 1989 interview with the *Whole Earth Review*: "This means that when you're able to improvise reality as you can in Virtual Reality and then that's shared with other people, you don't really need to describe the world anymore because you can simply make any contingency. You don't really need to describe an action because you can create any action." [78] According to Lanier, Virtual Reality promises a kind of interpersonal communication that is facilitated not by the manipulation of symbols that refer to and describe things, but by direct and immediate manipulation of the things themselves. Postsymbolic communication, then, cuts out the "middle man" of communicative interaction: "You actually make stuff instead of just referring to it." [79] Commenting on the consequences of Lanier's proposal, Michael Benedikt concludes that "language bound descriptions and semantic games will no longer be required to communicate personal viewpoints, historical events, or technical information. Rather, direct--if 'virtual'--demonstration and interactive experience of the 'original' material will prevail, or at least be a universal possibility." [80]

Lanier's formulation of postsymbolic communication achieves the communicative possibilities initially presented by the school of language at the fictional Academy of Lagado, which is described in part 3 of Jonathan Swift's *Gulliver's Travels*:

"Since words are only names for things, it would be more convenient for all men to carry about them such things as were necessary to express the particular business they are to discourse on. . . . many of the most learned and wise adhere to the new scheme of expressing themselves by things; which hath only this inconvenience attending it, that if a man's business be very great, and of various kinds, he must be obliged, in proportion, to carry a greater bundle of things upon his back, unless he can afford one or two strong servants to attend him. [81] **[End Page 81]**

Virtual Reality would not only realize the Lagadian system of expression by things, but would also solve its only inconvenience: by employing virtual objects rather than material ones, VR would facilitate the storage, transportation, and manipulation of the elements employed for communicative purposes.

In Lanier's projection of Virtual Reality there would no longer be Babelian confusion or the need for translation between languages. Furthermore, there would not even be the problem of intralingual translation caused by there being a number of different names referring to one thing within a given language; rather, there would only be the thing. "In language we have a notion of quality, such as redness or pudginess or something. In post-symbolic communication, why bother with those things when you can bring a jar containing everything you consider pudgy. Then the concept of pudgy becomes unnecessary, because you can look at them all at once and experientially get what's alike about them." [82] According to Lanier, it is the shared, homogeneous experience of the thing itself that constitutes an ultimate, universal protocol to which everyone and anyone has equal access. Once again, the Lagado institute had projected the same opportunity for its system of converse: "Another great advantage, proposed by this invention was, that it would serve as a universal language, to be understood in all civilized nations. . . . And thus ambassadors would be qualified to treat with foreign princes, or ministers of state, to whose tongues they were utter strangers." [83]

Lanier's formulation of postsymbolic communication, however, is confronted with two complications. On the one hand, it presupposes a specific understanding of the nature of language--namely, words are arbitrary signs that refer, ultimately, to things. This formulation, which was initially articulated in Aristotle's *De interpretatione* and has been instrumental in the fields of philosophy, linguistics, and semiotics, has been submitted to critical reevaluation in the latter half of this century. Structural linguistics, for instance, has argued that language exceeds this indicative, referential formulation. [84] For structural linguistics, "the key to language is not so much a connection between a word and a thing but an arbitrary designation that depended on a differential mark. Language for them is composed **[End Page 82]** of binary oppositions of signifiers--I/you, black/white, and so forth--whose ability to have meaning hinges on the stable relation between the terms or what they term the 'structure.' Language is theorized as a vast machine for generating such differential relations." [85] According to this conceptualization, the signification of words is produced not by reference to a transcendental signified but through the differential relations situated within and between signs.

On the other hand, even if one accepts the Aristotelian conceptualization of language without question, Lanier's postsymbolic communication does not necessarily escape symbolism or the ambiguity of the linguistic sign. Despite claims to the contrary, Virtual Reality cannot simply be divorced from the order of the symbolic. In the first place, as argued by Simon Penny in his essay "Virtual Reality as the Completion of the Enlightenment Project," the virtually dissimulated object is not identical to the object itself. The virtual cup is not a cup per se. "It is not that simple: the cup in VR is a representation, a stereographic image--you can't drink out of it." [86] The virtual cup is still a representation of a cup; therefore, a virtual object is no less symbolic than any other icon or word. In the essay "Virtual Reality as a Communication System," Frank Biocca and Mark R. Levy point out that "a 3D model of a house can be as ambiguous a sign as the word 'house.'" [87] Although the 3D model may (or may not) be a more effective means of coding the information, it is still a sign that refers to and indicates something else.

Finally, Lanier's own explanations have led to some rather curious contradictions. Virtual Reality, that which supposedly escapes description in and by symbols, is produced by the computer. Computers, however, according to Lanier, "live by description." [88] These descriptions are themselves designed and programmed through the manipulation of symbols. Far from escaping the limitations of symbolic description, Virtual Reality is necessarily produced in and by the manipulation of descriptive signs. The apparent flight of VR away from the symbolic is ironically produced and substantiated in and by that from which it flees. **[End Page 83]**

Deconstructing the Tower of Babel

When we say "Babel" today, do we know what we are naming? [89]

The computer, which has been determined to be a machine of language, proposes technological solutions to the *confusio linguarum*, returning the earth to the Babelian condition of one language and one lip for all. These restitutive endeavors, however, have been animated and legitimated by an assumption that remains unquestioned. In particular, they presume that the initial conditions described in the narrative are original and perfect, while the subsequent effects of linguistic plurality are derivative and catastrophic. The reparation of Babel that is announced by the computer, therefore, presumes that the plurality of language constitutes a catastrophe that has befallen an original and perfect means of communication. Because this "catastrophe" is considered to be both damaging and derivative, its reparation is both necessary and justified.

The various projects concerning the communicative potential of the computer have operated as if this interpretation of the Babelian myth were somehow self-evident and universal. There is, however, no necessity that the narrative be considered in this manner. It can be, and has been, read otherwise. Take for example the interpretation provided by George Steiner in his extended analysis of translation in *After Babel*:

The ripened humanity of language, its indispensable conservative and creative force live in the extraordinary diversity of actual tongues, in the bewildering profusion and eccentricity (though there is no center) of their modes. The psychic need for particularity, for "in-clusion" and invention is so intense that it has, during the whole of man's history until very lately, outweighed the spectacular, obvious material advantages of mutual comprehension and linguistic unity. In that sense, the Babel myth is once again a case of symbolic inversion: mankind was not destroyed but on the contrary kept vital and creative by being scattered among tongues. [90]

Steiner's reading suggests an inversion of the traditional interpretation of the Babelian myth. He intimates, evoking a Nietzschean trope, that the "catastrophe" of Babel, namely the multiplicity of languages, does not necessarily constitute a kind of damage to be repaired but a substantial advantage and gain. At Babel, humankind was not destroyed by confusion but was "kept vital and creative" through linguistic diversification. Consequently, the vitality and inventiveness **[End Page 84]** fostered by the wide range of particular idioms is determined to outstrip any advantages that have been ascribed to universal comprehension. Steiner, however, does not stop at a simple inversion of the usual evaluation of linguistic difference, which would amount to little more than a kind of naïve reversal. On the contrary, he also releases a disruption of the metaphysical structure that has organized and legitimated this system. Accordingly, not only does the differentiation of languages suggest a substantial advantage rather than a devastating loss, but this variation is not derived from or subtended by an original and/or primal identity--rather, it constitutes an original eccentricity that does not proceed from or possess a center. The multiple languages, therefore, neither originate in nor aim at monolingualism. On the contrary, they constitute a primal, necessary, and irreducible multiplicity.

The interpretation provided by Steiner deconstructs the Tower of Babel. *Deconstruction*, however, does not indicate "to take apart" or "to dismantle"; rather, it comprises a strategic intervention that necessarily takes the form of a double gesture of inversion and displacement. [91] Steiner's reading of Babel not only overturns the conceptual hierarchy that animates the traditional interpretation of the narrative, granting privilege and primacy to linguistic plurality over and against an original monolingualism, but simultaneously displaces the system that is overturned by emphasizing a fundamental and eccentric pluralism that does not derive from or fuse into a single and uniform center. Steiner's *After Babel*, therefore, not only occasions a general reassessment of the significance of the Babelian narrative, but also questions the project and goals of those endeavors that have been informed by its mythos. If, according to Steiner, the confusion of tongues is not an essential loss of a primordial homogeneity but a vital and creative heterogeneity, then the attempt to (re)establish a universal and ubiquitous idiom does not necessarily constitute a beneficent undertaking. Indeed, this endeavor may be allied with other forces and directed by alternative objectives. This possibility was assayed by Jacques Derrida during the roundtable discussion on translation that has been transcribed in *The Ear of the Other*:

What happens in the Babel episode, in the tribe of the Shems? Notice that the word "shem" already means *name*: Shem equals name. The Shems decide to raise a tower--not just in order to reach all the way to the heavens but also, it says in the text, to make a name for themselves. . . . How will they do it? By imposing their tongue on the entire universe on the basis of this sublime edification. **[End Page 85]** Tongue: actually the Hebrew word here is the word that signifies lip. Not tongue but lip. Thus, they want to impose their lip on the entire universe. Had their enterprise succeeded, the universal tongue would have been a particular language imposed by violence, by force, by violent hegemony over the rest of the world. [92]

According to the Derridean reading, the Babelian fable does not necessarily conform to the logic of a "paradise lost" scenario. The monolingualism that was interrupted and resisted at Babel is neither original nor universal. It is, instead, allied with a kind of imperialistic violence. The "one lip," therefore, does not constitute a perfectly transparent language to which everyone would have had equal access: "Rather, the master with the most force would have imposed his language on the world and, by virtue of this fact, it would have become the universal tongue." [93] The supposed universal idiom of the Babelian narrative, therefore, is nothing more than a particular language that would have been elevated to the position of universality by violent imposition. Yahweh, Derrida argues, opposes this hegemonic endeavor. His intervention is not a catastrophic interruption that destroys an original perfection; rather, his actions save the earth from the violence that would have been imposed on a global scale had the Shems succeeded. In this way, the so-called *confusio linguarum* that was imposed by Yahweh does not constitute a damaging loss of an original universality and communicative transparency, but provides a kind of protection from and resistance to the violence of totality and homogeneity. As Derrida describes it, Yahweh's intervention "interrupts the colonial violence or the linguistic imperialism" that would have been imposed at Babel had the Semites succeeded in their project. [94]

If the monolingualism of the "Tower of Babel" can be interpreted as a kind of linguistic imperialism, then the various attempts to return the earth to this condition may also be correlative with a kind of linguistic and cultural violence. The universal-language movement, for example, has been criticized for its association with cultural imperialism and ethnocentrism. Early universal-language projects, like the *Ars magna* of Ramón Lull (1232-1316), were initially devised for the purpose of converting the heathen to Christianity. Not only was this missionary activity complicit with the colonial expansion of Europe, but the choice of "universal" concepts and linguistic **[End Page 86]** material demonstrates a distinct European predisposition. This "unconscious ethnocentrism," as Umberto Eco calls it, continues to inform the language and linguistic projects associated with the computer and computer-mediated communication. [95] First, the technologies of machine translation, brain-computer interface, and Virtual Reality were not (at least initially) developed for purposes of intercultural communication: all three technologies were initially funded and inaugurated under the U.S. Department of Defense for purposes of national security. Machine translation not only began as an extension of wartime cryptanalysis by computer, [96] but was initially motivated by the "fear of Soviet technological prowess (particularly after the launch of the first sputnik in 1957) [which] stimulated much governmental and military support for Russian-English translation."[97] The various techniques and technologies of brain-computer interfacing were initially devised and developed by the U.S. Air Force for controlling combat aircraft, and a significant portion of contemporary EEG BCI research is funded and coordinated by the U.S. Navy's Cognitive Psychophysiology Laboratory. Virtual Reality technology was pioneered in simulator systems like the Link Trainer, which was employed during World War II to train combat pilots, the U.S. Army's SIMNET tank-battle simulation, and the U.S. Air Force's experiments with head-mounted display systems and haptic input/output devices. As Howard Rheingold confesses, "if necessity is the mother of invention, it must be added that the Defense Department is the father of technology; from the Army's first electronic digital computer in the 1940's to the Air Force's research on head-mounted displays in the 1980's, the US military has always been the prime contractor for the most significant innovations in computer technology."[98] Consequently, the enabling technologies of computer-mediated communication were correlative with a particular vision of national defense and cultural hegemony. This is not to say that the technologies in question could not eventually be disentangled from the network of their own genealogy, but that the disentanglement is not automatic: it requires, in the first place, that one take this complicated paternity and its consequences seriously. As Simon Penny remarks, technologies are never neutral but are always products of a specific culture. [99] **[End Page 87]**

Second, the general project of machine translation and the efforts of postlinguistic communication (the brain-computer interface and postsymbolic communication) have been formulated and organized according to a particular understanding of language and linguistic variation: linguistic difference is considered to be an empirical problem that can be overcome and mediated through techniques that appeal to and employ fundamental and universal elements (i.e., an original protolanguage, universal grammar, common cognitive capability, or the "things themselves"). This approach, which proceeds under the assumption of "unity within diversity" or "identity in difference," belongs to and is justified by a specific philosophical and cultural tradition. It is not, therefore, properly speaking, universal. Rather, it is merely a particular concept of linguistic diversity that has been imposed on the world and, by virtue of this fact, has been considered to be universal. Consequently, the post-Babelian concord that has been encoded in computer technology from the beginning constitutes nothing more than the imposition of a particular and restricted understanding of language and linguistic diversity that is derived from, and complicit with, Western metaphysics.

Finally, employing the "Tower of Babel" as a legitimating narrative for projects of universal communication is itself complicit with this ethnocentric trope. Although the "Tower of Babel" narrates an original, universal communion, it is a story that belongs to a particular culture and is narrated in one of the languages resulting from the Babelian confusion that it describes. Ironically, nominating Genesis 11:1-9 as the paradigm of universal communion determines universality from the position and in the language of one of the particulars. In this way, universal concourse is narrated through the violent imposition of one particular narrative form.

The "Tower of Babel" has been and continues to be one of the narratives anchoring and directing the research and rhetoric of computer-mediated communication. The significance of this myth, however, remains rather indeterminate. There is, as Derrida points out, a kind of fundamental undecidability or confusion at work within the Babelian narrative itself. [100] On the one hand, the narrative appears to justify and to ground the projects of universal language, machine translation, and postlinguistic communication--for it legitimates and directs the efforts of these projects by positing a fundamental unity that is not only the origin but also the programmed end of ontic, linguistic diversity. On the other hand, the narrative also connects the computer to an alternative reading, one **[End Page 88]** that not only questions the Western metaphysical assumption of unity within diversity but also criticizes its association with cultural imperialism and violence. In this way, the linguistic universality promised by the universal machine constitutes nothing more than one technique of a particular and restricted understanding of universality.

In situating the significance of computer-mediated communication under the Tower of Babel, cyberculture cannot help but be informed by the babble of these competing interpretations or translations of the narrative. For this reason, the Babelian myth, rather than anchoring the computer to a single, universal purpose and mission, renders its significance particularly indeterminate, manifold, and contended. Far from determining a rigid and univocal meaning, the "Tower of Babel" opens computer technology to the babble of Babel and the interminable task of translation. From the perspective of mainstream efforts in computer-mediated communication, a perspective that is correlative with the Western metaphysical desire for universality and totality, this situation can only appear to be a devastating loss and confusion--for what is at stake is the very assumption of universality and transparency that has been built into the computer from the beginning. From another perspective, however, this occurrence cannot help but appear to be otherwise--for the plurality that would have deformed the Babelian narrative can also be perceived as a significant advantage and gain, one that opens computer technology to a plurality of competing interpretations that makes room for irreducible and contestatory positions.

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Notes

1. Jerry Stratton, "What Is the Net?" <http://ac.acusd.edu/help/joy/whatisth.html>.

2. Umberto Eco, *The Search for the Perfect Language*, trans. James Fentress (Cambridge: Blackwell, 1995), p. 1.

3. Terry Winograd, "Computer Software for Working with Languages," *Scientific American* 251 (1984): 131.

4. Michael Heim, *The Metaphysics of Virtual Reality* (New York: Oxford University Press, 1993), p. 36. See also <http://www.jovanet.com/~mheim/>.

5. Eco, *Search* (above, n. 2), p. 73.

6. Heim, *Metaphysics* (above, n. 4), p. 93.

7. Norbert Wiener, *Cybernetics: Or, Control and Communication in the Animal and the Machine* (Cambridge, Mass.: MIT Press, 1948), p. 12.

8. As quoted in Eco, *Search* (above, n. 2), p. xii.

9. Heim, *Metaphysics* (above, n. 4), p. 94.

10. Wiener, *Cybernetics* (above, n. 7), p. 12.

11. Bruce Schuman, *Utopian Computer Networking*, <http://www.rain.org/~origin/ucs.html> (1988), p. 6.

12. Warren Weaver, "The New Tower," in *Machine Translation of Languages*, ed. William N. Locke and A. Donald Booth (Cambridge, Mass.: MIT Press, 1955), p. vii.

13. See "Translation Technology Alternatives," <http://193.145.43.46/de_yza/alumnes/MT.html> (1996). For an introduction to and historical overview of the discipline of machine translation, see W. John Hutchins, *Machine Translation*: *Past, Present, Future* (New York: Wiley, 1986); W. John Hutchins and Harold L. Somers, *An Introduction to Machine Translation* (New York: Academic Press, 1992); Doug Arnold, Lorna Balkan, R. Lee Humphreys, Siety Meijer, and Louisa Sadler, *Machine Translation: Introductory Guide* (Cambridge: Blackwell, 1994) (also available on-line at <http://clwww.essex.ac.uk/~doug/book/book.html>).

14. Muriel Vasconcellos, "Machine Translation: Translating the Languages of the World on a Desktop Computer Comes of Age," *BYTE* 18:1 (1993): 152 (also available on-line at <http://193.145.43.46/de_yza/alumnes/MT1.html>).

15. L. Chris Miller, "Babelware for the Desktop: Personal Computer and Workstation Translation Software Offers You the Most Affordable Access to MT," *BYTE* 18:1 (1993): 177 (also available on-line at <http://193.145.43.46/de_yza/alumnes/MT5.html>).

16. Erwin Reifler, *MT* (Seattle: University of Washington, 1951), p. 1.

17. Marshall McLuhan was canonized as the "patron saint" of the telematic world in the initial issue of *Wired* magazine (July 1993), and the name of Saint Marshall has been invoked in the masthead of every subsequent issue.

18. Marshall McLuhan, *Understanding Media* (Cambridge, Mass.: MIT Press, 1994), p. 80.

19. Acts of the Apostles 2: 7-8.

20. In her article on machine translation, Muriel Vasconcellos misspells Douglas Adams's "Babel Fish" as "babblefish." In doing so, she (either inadvertently or not) puts into play the linguistic confusion that has been determined to be the legacy of Babel and the object of translation.

21. Vasconcellos, "Machine Translation" (above, n. 14), p. 152.

22. Douglas Adams, *The Hitchhiker's Guide to the Galaxy* (New York: Pocket Books, 1979), pp. 59-60.

23. A similar device, actually named the Universal Translator, has been incorporated into the standard equipment of Star Fleet in the science-fiction television series *Star Trek*. According to the *Star Trek Encyclopedia*, the Universal Translator is a "device used to provide real-time two-way translation of spoken languages" (Michael Okuda, Denise Okuda, and Debbie Mirek, *The Star Trek Encyclopedia* [New York: Pocket Books, 1994], p. 361). In the original series, which made its debut in the mid-1960s, the Universal Translator was a hand-held device about the size of a standard flashlight (a graphic representation can be found in Franz Joseph's *Star Fleet Technical Manual* [New York: Ballantine, 1975], p. T0:03:02:04). In the sequel, *Star Trek: The Next Generation* (as well as its spin-offs, *Deep Space Nine* and *Voyager*), the Universal Translator is incorporated as a piece of software residing in the ship's main computer. According to the *Star Trek Next Generation Technical Manual*, "the Universal Translator is an extremely sophisticated computer program that is designed to first analyze the patterns of an unknown form of communication, then to derive a translation matrix to permit real-time verbal or data exchanges" (Rich Sternbach and Michael Okuda, *Star Trek Next Generation Technical Manual* [New York: Pocket Books, 1991], p. 101). Contemporary MT programs rely on a permanent, resident knowledge source. "The most essential of the knowledge sources is the dictionary--a file of records containing the words and phrases of the source language against which the input text must be matched" (Vasconcellos, "Machine Translation" [above, n. 14], p. 152). The Universal Translator of Star Fleet derives its knowledge source or "translation matrix" on the fly through an analysis of a representative language sample; it is therefore just as effective in translating a known language, like Klingon or Romulan, as it is translating a new and unknown idiom, like the languages of the Gorn or Kason.

The Universal Translator is a remarkable piece of technology for several reasons. First, it is virtually invisible. It is not present in the frame as a piece of equipment. This is extremely curious for a technoporn series like *Star Trek: The Next Generation*, which subsists as a home-shopping network of futuristic gadgetry. Second, because of this invisibility, the Universal Translator is ubiquitous and omnipresent: it not only functions for ship-to-ship communications but also operates as an interpersonal translator when the away-team has left the starship and is engaged in negotiations with an alien life-form. This ubiquity is generally explained by the com-badge, which Star Fleet personnel wear on their uniform, and which supposedly ties all crew members into a communications network with the shipboard computer and the universal translation subroutine (see Okuda, Okuda, and Mirek, *Star Trek Encyclopedia*, p. 361). However, translation services appear to be available even in those rare cases when the com-badge has been confiscated and/or disabled. Finally, the Universal Translator appears to be without operational limits: it does not seem to require any processing time, or to rely on previously entered data for making its linguistic calculations.

24. Quoted in Eco, *Search* (above, n. 2), p. 197.

25. Ibid., p. 199.

26. Luigi Heilmann, "J. J. Becher: Un precursore della traduzione meccanica," *De homine* 7-8 (1963): 131-134; Hutchins, *Machine Translation* (above, n. 13).

27. For information on these systems, see the following: CITAC, <http://www2.tia.net/citac/page3.html>; Globalink, <http://www.globalink.com/products.html#web>; PENSEE, <http://www.oki.co.jp/OKI/Home/English/Topic/PENSEE/index.html>.

28. Reifler, *MT* (above, n. 16) p. 1.

29. Klaus Schubert, "Esperanto as an Intermediate Language for Machine Translation," in *Computers in Translation: A Practical Appraisal*, ed. John Newton (New York: Routledge, 1992), p. 81.

30. A. Donald Booth, L. Brandwood and J. Cleave, *Mechanical Resolution of Linguistic Problems* (London: Butterworth, 1958).

31. Eco, *Search* (above, n. 2), pp. 346-347.

32. See Carnegie Mellon University, "Center for Machine Translation--Projects," <http:www.mt.cs.cmu.edu/cmt/projects.html> (1996).

33. Gavin Edwards, "Dejpu'bogh hov rur qablli!*" *Wired* 4:8 (1996): 84-93 (also available on-line at <http://www.hotwired.com>).

34. Emile Delavenay, *An Introduction to Machine Translation* (New York: Praeger, 1960), p. 47.

35. Yehoshua Bar-Hillel, *Language and Information: Selected Essays on Their Theory and Application* (Reading, Mass.: Addison-Wesley, 1964), p. 162.

36. Ibid.

37. Hutchins, *Machine Translation* (above, n. 13), p. 28.

38. Warren Weaver, "Translation," in *Machine Translation of Languages*, ed. William N. Locke and A. Donald Booth (Cambridge, Mass.: MIT Press, 1955), p. 23.

39. James J. Bono, *The Word of God and the Languages of Man: Interpreting Nature in Early Modern Science and Medicine,* vol. 1, *Ficino to Descartes* (Madison: University of Wisconsin Press, 1995), p. 185.

40. See Jacques Derrida, *Writing and Difference*, trans. Alan Bass (Chicago: University of Chicago Press, 1978), pp. 251-277.

41. Rodolphe Gasché, *The Tain of the Mirror: Derrida and the Philosophy of Reflection* (Cambridge, Mass.: Harvard University Press, 1986), p. 88.

42. Jacques Derrida, "Des Tours de Babel" in *Difference in Translation*, ed. and trans. Joseph F. Graham (Ithaca, N.Y.: Cornell University Press, 1985), p. 165.

43. Hutchins and Somers, *Introduction to Machine Translation* (above, n. 13), p. 1.

44. For a critical investigation of the practical limits of current MT technology, see Muriel Vasconcellos, *Technology as Translation Strategy* (Binghamton: SUNY Press, 1988); Newton, *Computers in Translation* (above, n. 29); Hutchins and Somers, *Introduction to Machine Translation*.

45. Alan K. Melby, *The Possibility of Language* (Philadelphia: John Benjamin, 1995).

46. Derrida, "Des Tours de Babel" (above, n. 42), p. 171.

47. Aristotle, *De interpretatione*, in *The Basic Works of Aristotle*, ed. Richard McKeon (New York: Random House, 1941), 16a5-8.

48. McLuhan, *Understanding Media* (above, n. 18), p. 80.

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