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THE EMERGENT CULTURE OF THE INTERNET: A STUDY OF THE
INCREASED PREVALENCE OF COMPUTER-MEDIATED COMMUNICATIONS

by

ROBERT E. MACLEOD, B.A.

A thesis submitted to
the Faculty of Graduate Studies and Research
in partial fulfilment of
the requirements for the degree of

Master of Arts

Department of Sociology and Anthropology

Carleton University

Ottawa, Ontario

July 17, 1995

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INCREASED PREVALENCE OF COMPUTER-MEDIATED COMMUNICATIONS"**

submitted by

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in partial fulfilment of the requirements
for the degree of Master of Arts

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Thesis Co-Supervisor

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The Emergent Culture of the Internet:
a Study of the Increased Prevalence of
Computer-Mediated Communications

by Robert E. Macleod

ABSTRACT

The increasing spread of computer-mediated communications will be associated with massive social and cultural effects. In order to support this postulate, a taxonomy of modes of communication is proposed, beginning with the oral mode of communication, followed by the literate mode of communication, which yields to the current electronic mode of communication. Just as there are two phases to the literate mode (the periods of writing and of typography) it is proposed that there are two stages to the electronic mode of communication: analog and digital. It is asserted that the change to an electronic mode of communication began a series of cultural effects in the analog stage that were exacerbated by the beginning of the digital stage. It is proposed that the sum of these effects is that literate cultural norms are being supplanted by the reemergence of a culture based upon the characteristics of primary orality.

Acknowledgements

Having now produced a single piece of work of extended length the reason so many acknowledgements focus thanks on the author's family becomes apparent. The truth is that a project such as this is not a solitary undertaking, but rather imposes itself on the author's entire kinship and peer group. Thus, I would like to thank first and foremost my partner Carole Hubbard, who not only bore the sole responsibility for our family while I was writing in isolation but was also dragged into the production process of the project in its later stages. Next, I must thank my two sons, Jeremy and Connor, who good naturedly suffered all manner of indignity and neglect as this project drew to a close. Also, much gratitude is owing to my immediate family of parents, parents-in-law and other siblings who all contributed in numerous ways that inconvenienced them. I also owe endless gratitude to Kathy Quinn whose help went far beyond the call of friendship. I consider her to be fictive kin. Next, I wish to thank both of my supervisors, Professor Brian Given and Professor Bruce Cox, who were exceptionally patient and understanding as I struggled with this project. Finally, many thanks are due the departmental staff at Carleton and the many friends and colleagues who all helped me get through this rite of passage in one way or another.

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The Emergent Culture of the Internet: a Study of the Increased Prevalence of Computer-Mediated Communications

Introduction

This thesis grows out of my research on the cultural effects of communications media. This work was based on a project of interpreting and updating the work of Marshall McLuhan, and applying the resulting theories to issues of the oral/literate interface, the effects of electronic media such as television, and the emergent cultural effects of the increasing dominance of digital computer-mediated communications (CMC). As this research process proceeded, however, I myself began to be affected by this object of study. James J. O'Donnell (1994:c-7), a professor of classics at the University of Pennsylvania discusses how the

intellectual domain that McLuhan inhabited is one that is unusually difficult to master satisfactorily. For it is striking that scholars who address the questions McLuhan did, whatever the historical period under review, find it hard to conduct their discussion of the history of the *conditions* of intellection in a way that satisfies the ordinary criteria of intellectual discourse. McLuhan, Ong, and Havelock knew one another and found solidarity in their mutual experience of marginalization.... The categories by which we *do* our intellectual business in the academic world are so deeply ingrained in us that to turn our power to relativize those categories, historicize them, and leave them as it were *sous rature*, intact but relativized, is, and *rightfully* is, unsettling and disturbing.

This quote captures exactly my relationship to my research. However, the difficulty I have experienced in formulating my ideas in the medium of print is somewhat offset by the fact that this is an academic thesis which incorporates the traditional custom of the oral defence. Though this component cannot be incorporated into the text of the thesis itself, it must be viewed as a meaningful and integral component of this thesis, which

operates to overcome the limitations of the written form when dealing with subject matter that questions the conditions of intellection.

My main hypothesis is that the increase in the prevalence of computer-mediated communications will be accompanied by massive social and cultural effects. Computer-mediated communications may be viewed as a constellation of many different media, for example MOOs, IRC, email, listservers, newsgroups, etc. I am interested in the most general effects of these media. Changes in dominant communications media lead to large-scale changes in culture. I believe the growing dominance of CMC is one such change, which may best be described as a paradigm shift (Kuhn 1970).

Based on the work of communications theorists such as Bateson, McLuhan and Innis, my research has led me to hypothesize that in addition to changes in individual communication style and identity, a shift in the dominant medium of communications from a base in electronic to digital technology will be accompanied by significant social and cultural changes. This shift will affect core cultural values by increasingly calling into question accepted concepts of spatial, geographical and political boundaries, canons of evidence, truth values, the meaning of property, individual and group identity, and the meaning and utility of information.

Theorization in this area continues to be weak; there has been much rhetoric about the effects of CMC but little empirical research published. I hope to contribute to both the building of useful theory and the provision of solid empirical evidence with this study. I have postulated a historical taxonomy based upon the dominant form of communication which I refer to as a mode of communication. I will propose a blueprint

onto which can be mapped the history of the changes in communications and the attendant changes in social and cultural norms and practices as well as in the constitution of individual identity.

This taxonomy recognizes three major periods, or modes of communication, beginning with orality, passing through a literate mode of communication, and ending with the electronic mode of communication. Further, it is my contention that we are currently in the middle of a shift within the electronic mode of communication from an analog to a digital phase. However, analysis of this transformation is complicated by the rapid rates of overall change in the world which have been accelerating since the beginning of the industrial revolution. I believe the cultural upheavals associated with the shift to the analog phase of the electronic mode of communication were not concluded before the next shift to a digital phase in the mode of communication began. Thus, the regular upheavals connected with any paradigm shift are currently particularly acute, and therefore may confound any attempt to perceive the underlying organized pattern of change. However, I believe that my taxonomy of the modes of communication will prove to be a useful analytical tool for this difficult task, which should prove worthwhile due to the explanatory power that is produced by such analysis.

Additionally, this project of working backwards from complex pattern to simple cause may benefit from the application of Bateson's ideas about logical types, which conclude that errors at one level of logical typing may not be carried over to the next, higher level. If the errors are pervasive, as an original comparison is replaced by a more abstract 'comparison of comparisons', the errors may drop out of the equation — much

as the technique of common factoring removes a term from a set of mathematical expressions (Bateson 1979:108, 118).

I hope that by applying my taxonomy to the problem of making sense of current trends, such as the simultaneous processes of globalization and localization (Morely 1991), many of the seemingly contradictory elements may be factored out in order to reveal the underlying pattern. Such factoring will show that the shift to a digital mode of communication is the most significant long-term trend. This information may then be used to help guide the policy choices which have to be made now and which will have long-term social effects.

Furthermore, besides the tendency of CMC to challenge and subvert any social norms which are based on the dominance of a literate world-view, the most significant effect of CMC arises from their use by private interests, primarily transnational corporations. As well as being enabling technologies for the very existence of contemporary transnationals, computer-mediated communications are implicated in the completion of the negative feedback circuit of a hegemonic global communications system which fosters and supports the interests of consumer capitalism. The CMC complete this system by fulfilling a polling function which has a small enough feedback time delay and fine enough resolution to be used as a form of panoptic surveillance (Foucault 1979; 1980). This system is capable of such a degree of discrimination that it may facilitate control of the global economy and corporate consumer commodity fetishism, and so maintain existing hierarchies. Using information culled from sources such as credit card records, government sources, magazine subscriptions, etc., data-bases

maintained and controlled by private interests correlate vast amounts of information about individuals. Details include demographic profiles, purchasing patterns, brand preferences, travel histories, personal interests and tastes (Rheingold 1993:291-3; Marx 1985). This information is then employed in the construction of statistical profiles which are used to fine-tune marketing and advertising strategies, and even influence product development. Finally, as the actual content of CMC becomes increasingly automated, the computer communications of individuals seem insignificant in comparison to communications between disparate computers, like the buying and selling decisions of the international financial market (Brand 1987:260-61). Given these suppositions, I will focus more on the ways that the more egalitarian (many-to-many) CMC fail to live up to the sweeping predictions made for their ability to radically improve life by making information readily available.

Because communication of some sort is necessary for building a shared consensual reality among disparate individuals, for passing on cultural information from one generation to the next, and even for the successful reproduction of the next generation, culture depends primarily on communication. However, communication may take an infinite number of forms and is not limited to our species alone. In fact, it could be argued that, broadly speaking, the communication of information lies at the very core of life itself (Bateson 1979).

Thus, it is important that anthropology, as a discipline, examine the theoretical issues raised by modern communications media, not least because they have now penetrated to all corners of the globe. Television is now watched by Bedouins in the

Sahara, Highlanders of Papua New Guinea, Amazon tribespeople in Brazil and peasants in remote rural India. Today the Kayapo Indians are said to carry Betacams as often as spears! Meanwhile, more and more cultural groups are finding their way onto the Net. Furthermore, the disciplines of mass communications and cultural studies are incapable of studying the social effects of new media *qua* media because they are bound by their theory and methodology. The cross-cultural holistic approach that is anthropology's strength is required for the task of distinguishing and comprehending the pancultural effects of the new media. A broadly based, long-term, contextualized study will be best able to discern the subtle, yet far reaching, effects of CMC.

Such research is also needed now, more than ever, since the Canadian government has declared that it is committed to the construction of what has come to be called the information highway or "infobahn." The Canadian Radio-television and Telecommunications Commission (CRTC) recently held public meetings and heard submissions on the possible forms that this network should take. This broadband network will eventually bring CMC into every home and onto every television set. The meaning of the information highway is at this moment being defined and its parameters are being established. Yet, there is little or no social-science research available on the effects of CMC to inform and guide these decisions; there is also insufficient comprehensive theory to guide such much-needed research. This work addresses both of these lacks.

Consequently, if, as Sherry Turkle (1984) maintains, the computer is an evocative object *par excellence*, and computer users are often engaged in working through issues of identity and control in their interactions with computers, then the question I seek to

address is: what changes when the computer is linked to a network and computing becomes computer-mediated communications? When the Personal Computer (PC) becomes a terminal —a gateway to the Internet— how does the individual's relationship with the machine change?

Turkle speaks of the fascination with rule-driven microworlds on the computer but this description is inadequate for the world of computer-mediated communications (CMC). While it is true that CMC are rule-driven, the Internet is certainly not a microworld. It is generally accepted in 'Net culture' that the Internet is an uncontrollable, somewhat anarchistic thing that grows and changes more like a living organism than any previous stand-alone computer. The phenomenal rate of growth in terms of users of the Internet, estimated to be ten per cent per month (LaQuey 1993:6), alone ensures that an individual cannot 'master' the universe of CMC. For example, while attempts have been made to build Internet versions of the phone book, it has proven a futile task. In fact, it has been impossible even to determine accurately the number of people with access to the net. As of June 1994 John Seabrook estimates the population of the Internet at twenty-three million users, "ten million of which have come on-line in the last nine months" (72). Even ignoring the problem the rapid growth in the number of users on the net poses, this means an Internet phone book would be a listing of twenty-three million people who are all only a local call away. Surely this situation calls to mind McLuhan's vision of the global village. Therefore, I postulate that computer-mediated communications forcibly thrusts the computer user back into a larger world of

unpredictable relationships, both with people on the Net and with the machinery of the Net itself.

As this network of connected computers becomes increasingly ubiquitous and global in scope, it produces a situation where the "human communication environment has acquired biological complexity and planetary scale, but there are no scientists or activists monitoring it, theorizing about its health.... Perhaps it's too new, too large to view as a whole, or too containing" (Brand 1987:258). I plan to address this lack of research into the effects of the emergence of a single complex system of global communications. When such a planetary level of complexity is reached there are qualitative changes in the system. After World War II the point was quickly reached where the "model of technology [had] become the biological process, the events inside an organism. And in an organism, processes are not organized around energy in the physicists' meaning of the term. They are organized around information" (Drucker 1985 in Brand 1987:xiv). This will bring about the end of the dominance of science as the organizing paradigm and lead to a change in the metanarrative. Stephen Tyler (1986:123) points out the situation then arises where:

Evocation —that is to say, "ethnography"— is the discourse of the post-modern world, for the world that made science, and that science made, has disappeared, and scientific thought is now an archaic mode of consciousness surviving for a while yet in degraded form without the ethnographic context that created and sustained it.

It appears the anthropologist as hero is resurrected just in time, the discipline is saved from decline and, instead, becomes central to the project of understanding the contemporary world.

This work is rooted in the presumption that a process of convergent evolution will occur between biological processes oriented around information and digital ones. Unlike strong AI supporters, I assume that by the time computers can reasonably emulate the human mind, they will have to be physically organized around the biological model of human life. Already we can see the beginning of the manifestation of life-like characteristics and processes in digital technology. Advanced silicon-based CPU chips now reach their design limit as they begin to incorporate biological variation and life-like uncertainty. The silicon DICE for the latest PCs are all manufactured to the same standards using exactly the same production process. It is only after they are manufactured that they are tested and sorted according to the uncontrollable variations that occur due to the complexity of the circuitry and the manufacturing process. The chips that manifest various non-functional traits are melted down, their material to be used again. Other chips work for all their functions but fail to operate at the specified clock-speed; these go on to become the slower, cheaper versions of their respective PCs.

The recent controversy about the discovery of a design flaw in Intel's Pentium Chip has led some to assert that microprocessor design has reached such a level of complexity that it has become theoretically impossible to predict completely the chip's functioning. If this is true, then the Pentium-equipped PC may represent the last of the von Neumann architecture machines. The theory of convergent evolution would then predict that the next stage in the evolution of the computer toward lifelike complexity is the parallel computer, such as Daniel Hillis' connection machine (1985) modeled on the interconnectivity of the human nervous system. At the same time, however, the human

brain contains both analog and digital features. This may mean that convergence will also have to proceed from a bioengineering perspective. In other words, as convergence proceeds towards "wetware", life-like heuristics will become a factor that limits precision. What this means for communications is that new theoretical models based on a better understanding of human communication become necessary.

Large, complex systems, computer-based and otherwise, already require legions of technicians to constantly coddle and massage the idiosyncratic system in order to make it work properly in a machine-like manner. This life-like aspect of complicated technology is perhaps usually forgotten so that humans need not be reminded that, as McLuhan pointed out, under conditions of mechanical extensions of the self, the human becomes merely a servomechanism to the machine. The person remains human but becomes enslaved to the machine.

As biology becomes bioengineering, Paul Rabinow (1992:234-52) suggests that instead of talking about sociobiology, we need to begin to speak in terms of biosociality. The latest development is the invention of "DNA computing" by University of Southern California computer scientist Leonard Adelman, who used genetic engineering to create short strands of DNA that were able to solve the classic travelling salesman problem of computer AI research. In the problem, a salesman "must visit each of a number of cities on a 'tour', starting and finishing at the same city and visiting all the others only once." The question is, "What is the shortest route he can take?" (Raggett and Bains 1992:218). In Adelman's experiment, the strands of DNA were mixed together in a beaker where their natural affinities caused them to connect to each other in various patterns that

mimicked the possible routes of the salesman. To find the solution, Adelman extracted the shortest molecule from among the various combinations; this one, then, represented the shortest path the salesman could take. This successful use of DNA as a computer spawned a conference in April 1995 which was attended by some two hundred researchers. While it is reported that the "excitement is, at present, mostly among computer scientists" it is also admitted that a "small but growing number of biologists are starting to think of biology as an information science" (*Economist* 1995:73-74).

The result of convergence is that when people begin to interact with digital computers organized around the biological metaphor of information, the human becomes a cyborg. This cyborg is created without any hardware ever being implanted in any body. The informational processes of the human and the machine become a single cybernetic system and the human/machine interface dissolves into transparency as the human begins to process information like a machine. The informants in Turkle's study (1984:84-86) who report that they relax through total involvement with the computer are experiencing the same effects which may be casually observed in living-rooms and arcades everywhere as children and adults play videogames. Increasingly, the person who 'surfs the Net' also experiences these effects.

All of this impacts on the development of computer-mediated communications, which, as a digital technology, is subject to the emergent properties associated with the change to informational processes. Thus, even though this work is ostensibly about computer-mediated communications, it is also about information — its meaning, utility,

and the effects of its being coded and transmitted in different ways. The revolutionary potential of this situation reaches out to all aspects of life.

Nevertheless, changes in communication are also implicated in the genesis of a global culture, which is not being studied in its own right as a cultural object. There is little research into this increasingly important area and the role that computer-mediated communications plays in it. Consequently, some of the most important questions of this time are not being seriously addressed. In his book *Reality Isn't What It Used To Be*, Walter Truett Anderson asks: "What will be the basic shape of the global culture? What values and beliefs will form the overall structure of global civilization?" (Anderson 1990:24).

Nicholas Negroponte, co-founder of the MIT media Lab believes that the key to understanding this relation lies in the fact that

all communication technologies are suffering a joint metamorphosis, which can only be understood properly if treated as a single subject, and only advanced properly if treated as a single craft. The way to figure out what needs to be done is through exploring the human sensory and cognitive system and the ways that humans most naturally interact. Join this and you grasp the future (Brand 1987:11).

In order to understand this process, however, it is also necessary to understand the technology itself and the theories behind it.

Robert W. Lucky, the Executive Director of Research for Bell Laboratories, Communications Sciences Division, discusses the nature of information and the way it differs from material commodities. His analysis, however, is rooted in a conception of information as a purely conceptual category, not as something with an ontological reality. It is as though he believes the signified can be removed from its signifier, while in reality

information always requires a medium of expression and, therefore, can exist only in a coded fashion. The manner of coding and the medium of expression profoundly affect the characteristics expressed by the information in question. A few examples will serve to illustrate this point. When information was coded as cuneiform writing on clay tablets it was decidedly not transportable, as Harold Innis (1951; 1986) reminds us. Before written records, complex information could only be stored or shared in a limited way. Anthropologists are familiar with the mechanisms for this process such as myths, rituals, poetic techniques, and redundancy — lots of redundancy (Ong 1982; Goody 1987). Even when information is coded electronically it is not free from this signifier-signified relation as, for example, in the limits of bandwidth for the transmission of digitally encoded video. It is only recently, with the development of fiberoptic phone lines and sophisticated compression algorithms, that real-time digital video can be transmitted.

As the product of an engineer immersed in the world of electronics and computers, Lucky's discussion tends to be most applicable to information coded either electronically or digitally. In spite of the fact that his analysis lacks awareness of the historical transformations of materially coded information, he provides a useful framework for facilitating further discussion of the effects of computer-mediated communications:

- (a) "Information can be transmitted virtually anywhere cheaply and at nearly the speed of light" (1989:5). Further, the cost of transmission for digitally coded information does not rise proportionally with the distance it travels, unlike the case for other media.

(b) "Information can be duplicated and shared" (7). Depending on the context, there are three possible outcomes for shared information. One: certain types of information may be shared without diminishing the value of the information. Two: some information may be diminished in value by the sharing, as for example, when a zero-sum game is involved. Three: information may be "self-synergistic" (7), that is, with shared information, the whole may be greater than the sum of its parts.

(c) The "creation of information does not necessarily consume natural resources" (9) and is itself an unlimited resource, although it tends to lose value quickly.

(d) Information is easily and cheaply stored. However, according to Lucky, "total expenditure for memory increases continually" (9) even though unit costs of storage regularly decrease. Several factors are simultaneously at work here. The primary relation is that while storage costs increase linearly with the amount of information stored, access costs increase logarithmically. In general, the overall amount of information stored tends to grow exponentially while the value of stored information tends to decrease with time. As the total amount of information stored grows, the cost and effort of purging the system of obsolete information becomes prohibitive. Because correlation costs also increase exponentially with the total amount of information stored the self-synergy effect of combining information will decrease with any growth in the amount of data stored. This situation results in an overall pattern where beyond a certain "breakpoint" (McLuhan 1964) the further accumulation of information changes the overall nature of the system from one where the storage of information is increasingly useful to one where the mass of information itself becomes a problem. Information becomes a thing to be

filtered, limited, selected. A new response is needed when dealing with large quantities of information. Thus, pattern recognition becomes the new paradigm (McLuhan 1964; Gozzi and Haynes 1992:226).

(e) "Information can be broadcast and networked" (Lucky 1989:9). It is these aspects of information that we are most familiar with through our experience with the regular media. (f) Information is leaky. It is hard to contain and to stop from spreading. The "consequences of this leakiness are profound.... The rigid hierarchy of leadership that was the commonplace of the industrial era melts down to a pool of consensus management in the information age" (12). Studies have shown that the introduction of computer networks into organizations changes the flow of information in a way that is mediated by the organization's structure and social dynamics (Hakken 1993; Barnes and Greller 1994; Mantovani 1994). Nonetheless, networked information tends to make pyramidal work relations more informal and egalitarian as information becomes more widely dispersed and generally available (Sproull and Kiesler 1991; Burkhardt and Brass 1990). Additionally, information's inherent leakiness means trying to make information, as such, into intellectual property is problematic because the leakiness of information is a property somewhat separate from its medium of expression. Hackers, who may have a better intuitive understanding of the effects of digital information than anyone else, have a credo that states 'information wants to be free'. It may do well to remember that shareware arose not simply out of an altruistic impulse but also from the practical difficulties of information's leaky nature. Lucky, however, maintains that "it will not do

to concede the principle that information by its very nature must be shared" (14). This raises the issue of technological determinism.

Traditional discussions of technological determinism have been marred by unconscious, unquestioned assumptions of efficient causality. However, when the contemporary world is characterized by "an increasing dependency upon extraordinarily complex systems" (Lucky 1989:13) the discussion of technological determinism must grow beyond such simplicity. My position is that technology is not value-neutral. While a given technology may not by itself constitute an efficient cause, it may favour a certain set of articulations over another (Postman 1985; Smith and Marx 1994). The triumph of the VHS videocassette format over the technically superior Beta format is enough to put to rest any cries of technological determinism. Just as the economies of scale of machine production favour the assembly line, standardization, and mass marketing, I believe that digitally coded information presses for free exchange, egalitarian sharing, a process orientation, and profound mutability/customization — what has been called "its essential typographical plasticity" (Lanham 1993:xi). The process of incorporating and adapting to digital technology is a social one, where the structures and habits of the old order will tend to be applied to the new one. Nevertheless, digital technology may threaten the very foundations of modernist society by undermining the principles of capitalism and machine mass-production. These threats are being felt now and have already engendered a response. World-wide crackdowns on unauthorized copying of information (Acheson and Maule 1991:298) such as is contained in books, videocassettes, and computer software, show that the new developments in information technology are being met with a

legislative response. It has been pointed out that the "first defensive tactic by the owners of an old medium against competition by a new one is to have the new one prohibited. If this does not work, the next defensive tactic is to buy into the attacker" (Pool 1983 cited in Brand 1987:218). Both responses are currently being tried. This relation may work for differing media that code information in the same general way, but will it provide protection from the threat of change caused by a paradigm shift (Kuhn 1970) where the overall coding method changes from analog to digitally coded information? When one remembers that the rule of law itself is a product of the coding of information in written records which allowed case law to be based on precedents and uniform comparable statutes (McLuhan 1964; Gozzi and Haynes 1992:220; Lanham 1993), it becomes apparent that a legislative response may not be sufficient to control and limit the articulation favoured by digitally-coded information.

It is important to note that the capitalist mode of production was not necessarily the generative model for the development of digitally-coded information and computer-mediated communications. These were heavily supported by public funds. In some cases the property-oriented capitalist model was applied after the fact, as was the case when

The first personal-computer makers were outraged when William Gates, now the richest man in America, started selling BASIC, which PC hobbyists had always passed around for free. The software industry exists now and Microsoft is bigger than General Motors, but the Net continues to grow because of intellectual property that skilled programmers have given to the Net community. Again and again, programmers have created and given to the Net powerful tools that have changed the nature of the Net and expanded its availability. (Rheingold 1993:102)

Notwithstanding the above, simple optimism about the democratizing potential of computer-mediated communications may be unwarranted. It can be seen here that simple

causal relations do not apply when dealing with complex technology and complex systems. The same technology can simultaneously promote different effects. The overall outcome then depends upon the interplay of the social relations surrounding the technology's use.

The result is that when discussing technology and complex systems it is important to avoid deterministic arguments based on unconscious assumptions of efficient cause. Howard Rheingold's book *The Virtual Community: Homesteading on the Electronic Frontier* (1993) includes whole chapters on the nature of computer-mediated communications in France and Japan. In both cases, cultural factors have led to a medium quite distinct from the Internet. However, neither the French nor the Japanese systems which Rheingold discusses are linked to the Internet. He questions whether full Internet access might not affect these systems with a homogenizing influence. He concludes others will have to "face the conflict that Japanese and French telecommunications planners must address: to refuse to join the Net in its widest sense and face being left behind or to join the Net and face social upheaval" (Rheingold 1993:240). This points to the nature of computer-mediated communications as an increasingly unitary system global in scope. As Wallerstein (1976) has shown in his discussion of the modern world system, when the unit of analysis is such a unitary system, most standard methodologies are not applicable because they are based on the fundamental idea of comparison. He realized that social scientists studied "social systems" as though they were autonomous units; they failed to take into account structural factors external to the unit of study. Wallerstein's response was to use a multi-

causal 'unidisciplinary' framework which abandoned the idea of autonomous systems to explain the historical rise of capitalism. He sees this type of analysis as important because humankind's "ability to participate intelligently in the evolution of his own system is dependent on his ability to perceive the whole" (1976:10). As another global system, computer-mediated communications also require this style of analysis — one which is attempted here.

In discussing the social relations of power that surround the introduction and spread of the new digital technology of computers and computer-mediated communications, Langdon Winner (1986:112) compares the optimism of CMC advocates with that of an earlier group.

Of all the computer enthusiasts' political ideas, there is none more poignant than the faith that the computer is destined to become a potent equalizer in modern society.... Presumably, ordinary citizens equipped with microcomputers will be able to counter the influence of large, computer-based organizations.

Notions of this kind echo beliefs of eighteenth-century revolutionaries that placing fire arms in the hands of the people was crucial to overthrowing entrenched authority.... [H]owever, the fact that the popular forces have guns may not be decisive. In a contest of force against force, the larger, more sophisticated, more ruthless, better equipped competitor often has the upper hand. Hence, the availability of low-cost computing power may move the baseline that defines electronic dimensions of social influence, but it does not necessarily alter the relative balance of power. Using a personal computer makes one no more powerful vis-à-vis, say, the National Security Agency than flying a hang glider establishes a person as a match for the U.S. Air Force.

Winner's choice of the U.S. National Security Agency (NSA) as an example of a powerful force to be reckoned with is quite appropriate since the NSA is the organization with the most computing power in the world (Rheingold 1993:295) and a budget larger than that of the CIA (Roszak 1986:184). Its principle activity is the routine monitoring

of electronic communications (Roszak 1986:184; Seabrook 1994:78). It is the NSA that designed the controversial Clipper Chip that incorporates technology that could give the government the ability to easily monitor all communications on the Net. John Seabrook captures the ambivalence of many about the democratizing potential of CMC when he discusses the role of the NSA. He says the government is "putting it in charge of protecting people's privacy" which as "an organization so secretive that for many years the government tried to deny its existence." This leads him to wonder "... which I should be more afraid of — criminals or spies" (1994:78). Perhaps the balance tips toward a fear of the spies when it is noted that the Reagan administration, without consulting Congress, made the NSA

solely responsible for the control and use of all federal computers and data banks. The powers contained in the directive permit the NSA to have access to all government computerized files with no provision made for the protection of privacy. The directive also implies that the NSA has the right to pursue its mandate into all private data banks linked to government operations (Roszak 1986:185).

A principle distinction to keep in mind while examining the effects of computer-mediated communications is the information pyramid which Lucky visualizes as "a hierarchy of organization" (1989:20). At the bottom of the pyramid is *data*, the raw material or "sludge of the information age" (21), consisting of, for example, unprocessed observations and random sights and sounds. The next stage, which Lucky refers to as *information*, is the first organization of raw data. At this stage, information is "only a collection of unconnected, or perhaps unassimilated, facts or fictions" (21). Information which is assimilated into one's personal internal framework becomes *knowledge*, the third level in Lucky's hierarchy. The highest level of organization is *wisdom*: "organized,

distilled and integrated knowledge...the putting together of a base of knowledge in such an integrated fashion that it is possible to create new associations —new knowledge— from the accumulation" (21).

This hierarchy of information provides an analytical tool which will be used in this thesis to examine the effects of computer-mediated communications. However, Lucky's definition of wisdom requires further elaboration. I wish to reserve the term wisdom for knowledge which has been used over and over and tested against the world in multiple concrete situations. This allows the knowledge to be richly contextualized and to become embodied. Thus, wisdom is knowledge about which the user has accumulated the experience necessary to provide an understanding of the limits of its applicability. My emphasis here is on time, context, and embodiment.

Lucky's taxonomy is useful but requires some elaboration in order to account for some properties of information in systems. As one ascends through the hierarchy one moves from lower to higher levels of organization. However, apparent total disorder can, under certain conditions, be converted to a very high level of organization by a simple operation that transcends the information pyramid. In other words, order can be sublimated out of disorder. Some of this relation stems from the fact that certain types of order may be more difficult to perceive than others. Order can be sublimated out of disorder, much as a crystal forms in a supersaturated solution. Order may appear out of randomness through the application of stochastic processes, which, when combined with Gregory Bateson's definition of information as "any difference that makes a difference" (Bateson 1979:228) leads to the conclusion that the subject is an integral part of any

information system. There is no guarantee that a difference which makes a difference to me will make a difference to anyone else. Will the levels of the hierarchy discussed above "make a difference" to every observer? Not necessarily. One person's data may be another's information. This points in the direction of chaos and complexity, which are based on an understanding that even data is not distinct from its context of observation, including the observer's internal state.

From this analysis, we can see that information is extremely context-specific. The communication of information is affected by both its form and its content. The subject and object, observer and observed, are both an integral part of the information relationship, since without some agent of difference there is no information. Because the naturally evolved human capacity for processing information is extremely complex and efficient, if the convergence thesis is accepted, one of its corollaries must be that electronic communication will become somewhat more life-like and based upon principles of human communication. As the convergence proceeds, theoretical models of communication will have to change to incorporate principles of human communication.

The next task is to outline the conceptual framework I have proposed. This framework is necessary in order to facilitate the investigation of the effects of the intricate change, from the literate to the electronic mode of communication. I believe this is the first major paradigm shift in communications structures since the change from primary orality to primary literacy.

Chapter Two: The Mode of Communication

I propose a relation where the predominant medium of communication structures the form of the language of communication in specific ways, such that a certain set of personal and cultural traits are favoured over others. This relation constitutes a sort of communicative materialism which could then be traced through its historical ontogeny to provide an analytical framework that would correlate many variables such as individual identity, cultural and political systems, ideologies, and values. Such a framework might then be utilized to make sense of the confusion arising from the shift from one major paradigm to another. Accordingly, I shall outline here my proposal for such a framework.

The communication medium with which I will begin is that of primary orality (Ong 1982). Humans have been using language from early enough in their evolutionary history that speculation about possible earlier forms of communication becomes imbricated in questions of marking the dawn of the human species. Suffice it to say that non-language based communication systems would presumably be associated with more primate-like forms of social organization. Communication would be concrete and limited. Simple calls and signs as well as facial expression and body-language would be the extent of the pre-language assembly.

As with any technology, language would evolve from a lower level of refinement to higher levels until the point is reached where a new technology is discovered/invented. Even the most undeveloped state of any new technology offers certain advantages over

the previous technology, as the development of the heat engine illustrates. The first power sources utilized by humans were animal, water, or wind based. Animal power requires high maintenance, storage space, and is in practice limited in total output by diminishing economies of scale. Water power is limited in the amount of power any given waterway can generate and is decidedly not a portable source of energy. Similar limits restrict the application of wind power.

The invention of the earliest heat engine, the steam engine, provided certain advantages over these forms of energy even in its most primitive incarnation. It was not tied to a certain geography and was able to produce higher total outputs than was practical with animal power. One of the first uses of steam engines was the powering of mills that were expanding or that needed to be located away from water power. Another early use was the steam locomotive, which required a high power output. After its invention, the steam engine underwent a long process of refinement that steadily improved its efficiency, power, portability and reliability. Finally, however, this course of development was arrested by the invention of the Otto cycle engine, or internal combustion engine. The earliest, most inefficient examples of this new technology provided real advantages over the previous steam technology. These engines were smaller and lighter for a given output, easier to fuel, and produced no solid waste requiring disposal. Advocates of progress would propose that the cycle of development of the heat engine continued with the introduction of nuclear power. The early stage of this technology began with fission but supposedly will end with fusion, making energy 'so cheap that it is not worth metering'. Notice that if this schema is followed, then the

entire process of the development of the heat engine is indeed a "cycle", since the sun is ultimately the source of the fuel for all other previous heat engines and the fusion of hydrogen is the very energy source of the sun.

One other relation between new technologies and their precursors is to be noted here. As McLuhan (1989:viii, 6) recognized, when a new medium or technology displaces another, the old technology does not disappear but lives on as aesthetic object. My favourite example of this transformation is the clothes-pin. The spring-operated clothes-pin is a more flexible, easy to use and to manufacture device than the old styled clothes-pin with its two prongs machined out of a single piece of wood. The hegemony of the modern clothes-pin seems complete until one remembers that old-style clothes-pins are available, at exorbitant prices, from local craft stores. They persist here for the purpose of providing the foundation for various decorative crafts, such as dolls. The cultural practices of folk art, which use materials readily available in the home to produce aesthetic objects, have survived unchanged into a time where the only remnant of the old-style clothes-pin is as purely aesthetic object. Of further note is the commodification of the clothes-pin and the establishment of a relation of economic exchange that did not exist previously. While speculation about the possible aesthetic uses of nuclear fission approaches the ridiculous, small working toy steam engines are available today, miniature waterwheels adorn decorative gardens, and it is a common dream of children to own a horse for sport or as a pet. McLuhan's (1964:218-19) prediction that in the future all cars would be sports cars is completed by the recent appearance of "sport" versions of even the utilitarian and now ubiquitous minivan.

These general relations are also identifiable within the developmental history of communications media. The first stage, primary orality, is superseded successively by the introduction of writing and the subsequent rise of print and typography, the genesis of electric media which began with the telegraph and proceeded to the development of television, and finally the rise of digital communications media. This taxonomy is not an absolute structure with impermeable boundaries defining completely distinct categories; rather, it is a taxonomy of paradigms. Just as with Kuhn's scientific paradigms, the gaps and inconsistencies in the delimitations are always present, but the concept of paradigm explains the social dimension whereby such challenges to definition do not prevent the production and maintenance of the dominant structuring metaphor precisely in the face of such inconsistencies. Thus, for example, the digital coding of information is not as unique and recent a technological development as the above historically sequential taxonomy implies, for the first electric communication technology is, in a limited sense, the first digital communication technology.

Moreover, cultural changes do not occur all over the world at same time or even spread to all corners of the globe, and their effects are distributed and variable. Horses and water power, for example, are still used in many parts of the world. Many oral communities still exist and the categories themselves are confused. For instance, the Kayapo by-passed literacy and proceeded directly to Betacams, which they used to produce their own video materials to save their own culture and to bring their survival problems to the world. Similarly, the Inuit enthusiastically embraced television with the

Inuit Broadcasting Corporation (IBC) and Inuit controlled radio stations.¹ Notwithstanding the above, it is worthwhile to explore the paradigmatic conceptions of communications eras.

Formal Taxonomy

Communication is composed of both a channel, or carrier —its formal characteristic— *and* some kind of content — its message or information. The majority of attention has traditionally focused on the effects of this content on individuals and cultures. However, questions about what effects arise from the form a communications channel takes, such as in speech or writing, also require attention. The work of Walter Ong (1982), Jack Goody (1987) and others has shown that there are cultural effects at this level, but debate continues about their relative impact.

Undoubtedly, the most famous statement on this issue is Marshall McLuhan's (1964) assertion that 'the medium is the message'. McLuhan believed that the effects of the form of a communications medium would outweigh and overshadow the effects of any possible content that could be transmitted through that medium. He did not believe there were *no* effects arising from the content of a medium, but rather that they would be relatively less significant. When McLuhan was vehemently attacked and his theories labelled as simple technological determinism, he responded predictably by focusing even more on the effects of media *qua* media and all but ignored content. This resulted in a

¹ Two different informants who were technical trainers for the Inuit during the introduction of these systems both reported that the Inuit were very fast and capable learners of these technologies and seemed to have an intuitive grasp of the logic of these media.

polarization between those who accepted his work in spite of its pop culture popularity and those who marginalized his work in the "serious" academic world. Thus, serious exploration of these issues in the academic mainstream was delayed by twenty years.

In spite of these circumstances, a large and increasing body of literature has developed which implicitly accepts the McLuhan hypothesis that there are cultural effects due to the form of communications media, and which debates the degree of the significance of such effects relative to those ascribed to content. I postulate that there are significant effects on both individual cognition and perception, and thus identity, as well as on the level of cultural forms which stem from the form of communications media. These effects are not the result of a strict determinism, however, but arise from the interplay of technical and physical factors with social and cultural ones.

Neil Postman (1985:84) makes a distinction, which McLuhan failed to maintain, between a technology and a medium, where a medium is the combination of a given communications technology and the set of social practices that surround it and shape it. "A technology becomes a medium as it employs a particular symbolic code, as it finds its place in a particular social setting, as it insinuates itself into economic and political contexts" (1985:84). For instance, the technology of television is essentially the same everywhere, but differences in social practices surrounding the technology produce television as a different medium in different cultures. The resonance theory of communication (Schwartz 1973, 1981) maintains that it is necessary to consider the entire social context of the communication process, including those structures, beliefs and knowledge already stored in the people doing the communicating. Accordingly, the

television medium around the world varies from the laissez-faire commercial medium in the USA, to the CRTC-regulated, mixed ownership medium in Canada, to the state-controlled medium of totalitarian countries.

Given that these variations in media are all based on the same technology, it becomes necessary to consider the importance of what Ong (1982:56) called 'interiorization'. In his studies of orality and literacy he noted that before the effects of the form of a medium such as writing fully manifest themselves in an individual, that medium must have been fully "personally interiorized" as the dominant structuring paradigm. Ong (1982:1) spoke of primary orality —defined as "cultures with no knowledge at all of writing"— and primary literacy, and found that people could learn to read and write without being affected by literacy unless their cognitive processes came to be dominated by the literate metaphor. In support of Ong's conclusions, Conrad Phillip Kottak found, in his study on the effects of the introduction of television to Brazil, that Brazil as a nation had never been deeply integrated into primary literacy. According to Kottak (1990:149), "Brazilians tend to stigmatize reading as antisocial". They "relegate books to a sphere beyond humane, personal society" (1990:144). In fact, Brazil "actually outlawed printing presses until the 19th century" (1990:143). Thus, we could conceive of Brazil as having never reached the stage of primary literacy, even though formal literacy is widespread.

After interiorization is complete, however, the individual's thoughts, and even speech, will become structured according to the norms of literacy. For example, the additive summation of concepts, such as is captured in the book of Genesis with its use

of "And this... And that... And then this..." etc, is traded for the subordination of clauses arranged in logical sequence. In his *American Indian Autobiography*, David Brumble (1988:3) discusses the way that for historical reasons the transition to literacy occurred among North American Indians in a single generation. He notes that "the preliterate autobiographies especially put before us conceptions of the self that are foreign to modern, individualistic societies".

On a cultural level, a communications technology must achieve a similar sort of communicative hegemony before the full force of its fundamental effects are felt. I choose to call such a dominant communications technology a mode of communication. This mirrors the way the full effects of a paradigm only arise after the upheavals of a paradigm shift are past and the reign of the new paradigm is stable. Thus, Ong's primary orality and primary literacy represent ideal types of two distinct modes of communication with paradigmatic status.

My historical taxonomy of these modes of communication, which begins with orality, passes through a literate stage and leads to an electronic mode of communication, is quite useful for mapping other cultural phenomena.

The Oral Mode of Communication

The oral mode of communication is associated with tribal societies and is characterized by membership of individuals in a gestalt where the emphasis is on 'being a part of things.' Brumble's (1988:54) study of Indian autobiographies confirms that "these early Indians conceived of themselves as tribal beings." Everyone participates,

everyone sings, plays an instrument, or dances. There is no separation of subject and object. The body is a stable solid, known by its exterior, and related to other bodies in public, Cartesian space through its actions (Bakhtin 1981:104-110). Social relations tend towards egalitarianism and are governed by the norms of orality where knowledge is produced in dialogue, is processual, and myth and ritual are the content of communication. The top level of the information hierarchy, wisdom, is valorized within such a society since it offers the most compact, condensed, and stable form of information storage. The main structuring metaphor is the organic metaphor of Functionalist theory, where the social body corresponds to the physical body, and each part's function contributes to the operation of the whole.

The Literate Mode of Communication

As the upheaval of the paradigm shift gives way to the more stable new paradigm, the sweeping effects of the dominance of the literate mode of communication become ubiquitous and figure fades into ground (McLuhan and McLuhan 1988:5). This shift to a literate mode of communication brings massive changes on all levels.

It is important to note McLuhan's distinction between two separate stages or phases in this mode of communication. The first is the introduction of phonetic writing and the second is the rise of typography to dominance, which facilitated the full manifestation of the effects of literacy. With this distinction, feudal society may be viewed as a transitional form associated with the writing of scribes and scriptoria which

began the process of culture change but did not reach its zenith until the rapid spread of typography completed the process and ushered in the age of modernist social relations.

The individual, constituted by a literate mode of communication, exists as the stable but bifurcated identity of the reified individual. Identity and body are constituted by an inside *and* an outside. Identity structured around Cartesian dualism and logical positivism suffers a mind/body problem. The inside is mysterious and only sometimes, if ever, manifests in surface phenomena on the exterior (Bakhtin 1981:111-258; Barker 1984). The emphasis is on 'being there' rather than being a participant.

The permeable bodies of this period are arrayed in the relativistic space of the separated public and private spheres. There is separation of knowing subject and known object. Paul Rabinow (1986:235) discusses the Greeks, whose civilization spanned the change from primary orality to primary literacy:

For the Greeks there was no sharp division between external reality and internal representations. Unlike Aristotle, Descartes's conception of knowing rests on having correct representations in an internal space, the mind.... [B]eginning in the seventeenth century, knowledge became internal, representational, and judgmental. Modern philosophy was born when a knowing subject endowed with consciousness and its representational contents became the central problem for thought, the paradigm of all knowing.

This then sets the stage for the rise of science and logical positivism to dominance.

Here social relations are, similarly, characterized by the separation of production from consumption or use. This is the hierarchical society of the spectacle (Debord 1983). The norms of literacy, linear logic and positivism are associated with visualism and the strong sense of ego fostered by having a private 'point-of-view'. Consequently, the

contrary impulses of personal heterogeneity within overall cultural homogeneity result (McLuhan 1960:37, 47-56; Postman 1992, 1985:29, 51; Kernan 1990:132; Innis 1951).

Cultures characterized by the literate mode of communication tend to valorize the knowledge level of the information pyramid. Knowing things in extensive, thorough and specific detail is favoured when the main storage medium for information is the written word, especially as it exists as the stable text of the printed codex. The main structuring metaphor of the literate mode of communication is bricolage where endless variation and change at the micro-level exhibit an overall stability of structure at the macro-level. Obviously, the theoretical construct here is structuralism.

The Electronic Mode of Communication

Subsequently, we arrive at the main focus of the paper which is the effects of the shift to an electronic mode of communication. Unlike most researchers in this area, I distinguish two separate historical phases in the transition to an electronic mode of communication: the electric or analog phase and the digital stage. Even though he did write about computers, which were already a well-established cultural icon at the time, McLuhan himself, perhaps because of a lack of esoteric technical understanding (he was, after all, really a professor of English literature), did not distinguish between digital electronic media and analog ones.

There are two possible reasons why the importance of this separation has been generally overlooked. The first may be a consequence of the negative connotations associated with computers which persisted until the quite recent introduction of the

Personal Computer or PC. As long as 'computer' meant 'mainframe' it also meant big business and government, the impersonal and autocratic treatment of 'do-not-fold-spindle-or-mutilate,' and the irony of GIGO (garbage in garbage out) —paradoxically removed from the discourse just when it was needed more than ever. Thus, above all, the early mainframe computer meant powerlessness— in short, the computer was a thing of *evil*

All of this changed with the introduction of the PC (Turkle 1984:166-7, 172-3). Almost overnight, the negative connotations connected with computers underwent a structural reversal and the computer became a symbol of liberation, empowerment, radical democracy or anarchy and, above all, problem solving. The computer had now become *good*. This symbolic transformation alone provides a fascinating topic for research, but is beyond the scope of this paper.

With the wider acceptance of the PC, the computer went from being a solitary monolithic device to being seen as a small part, or node, of a much larger network linked by communications. Thus, it is not surprising that McLuhan and others have failed to see the digital computer as a medium in its own right, since until recently the computer was not primarily considered a communications device. Further, I believe this most recent development of the computer as a communication device may prove to be the *most* significant element of all in terms of long-term social and cultural ramifications.

It is important then, in this analysis of the electronic mode of communication, to attempt the difficult task of differentiating between the analog stage of this mode of communication and the digital one. The difficulty of this task is compounded by the challenge of factoring out both the cultural effects that are purely associated with the

upheavals of paradigm shift, and the trend towards convergence of all media. This difficulty is further compounded by the by now absolute rapidity of exponentially accelerated change.

The Analog Phase

Establishing the beginnings of grand eras is a somewhat arbitrary task of limited utility, but for our purposes the analog electric mode of communication may be considered to have begun with the first demonstration of the telegraph by Samuel Morse in 1844. Some idea of the extreme speeding up of human affairs by the introduction of electric communications devices may be grasped when it is pointed out that "the first known use of the telegraph by a newspaper" to transmit news "occurred *one day* after Morse gave his historic demonstration" (Postman 1985:66-67) on May 24 1844. On that day, what remained of any Innisian space bias instantly reversed into the beginning —the *renaissance*— of the decentralized but recombinant relations of a time bias. This change ushered in the beginning of a process of paradigm shift, the effects of which still reverberate today. The first stage in this shift was completed by the development of electric/electronic media such as the telephone, radio, and television. Apart from collapsing both time and space and ushering in the age of McLuhan's global village, the main effect of these media was to attack and subvert most of the norms associated with the literate mode of communication. Thus, for instance, both the telephone and radio are clearly oral media of communication, and it was McLuhan's particular contribution to show how television is also an oral/aural medium which makes the eye work like the ear

in terms of the manner of processing the visual information provided by the cathode ray tube (CRT).

However, as Ong (1982:56) showed with his conviction about 'interiorization', it is possible to be familiar with a medium without fully internalizing the epistemological effects of that medium. Thus, in a reversal of the shift from orality to literacy, the early content of radio and television was highly literate speech structured around the logical norms of literacy. It was not until the electronic media became ubiquitous and pervasive that the full effects of their semi-return to orality were manifest. I use the term semi-return because under the electronic mode of communication, the oral content of the dominant media has remained infected by literate norms. For example, almost all television content, including the inconsequential banter of local TV news hosts, is scripted and, thus, exists first as written text. Television programming and production is further dependent upon other written texts such as legal contracts and technical manuals.

Since there are still many residual literate values in place, I consider the cultural form associated with the electronic mode of communication as post-literate. This stage intensifies as the nature of electronic media works to produce a single, globally-pervasive realm of electronic experience shared by the vast majority of humans on the planet. For example, Kottak reports on a 1984 survey that "Brazilians could identify a photo of Michael Jackson as readily as a photo of the Pope and more easily than Ronald Reagan or than photos of the major Brazilian presidential candidates at that time (1990:134). This media-mediated construction of reality —'it's not real unless it's on TV'— has a

homogenizing influence which leads to globalization. Nevertheless, the disjuncture of lived experience with mediated experience gives rise to simultaneous impulses toward localization.

That the operation of transnational capital is a part of this process is no surprise. The electronic mode of communication tends to undermine the nation state, which requires boundaries and ideas of shared identity and contagion. At the same time, electronic media act as an enabling technology for the rise of the transnational corporation itself, which soon begins to challenge the dominance of the nation-state. In this analysis it is important to keep in mind that the economic power of many multinational corporations exceeds that of many nation states (Tomlinson 1991:37). When Vernon wrote his influential and groundbreaking work on the spread of multinational corporations, *Sovereignty at Bay*, he noted that the annual sales of General Motors, then at \$25 billion, was "larger than the gross national product of about 130 countries" (1971:7).

However, there have been companies with international scope for a very long time and transnationals have existed since the end of the second world war. What need to be distinguished are the differences between international trade and transnational corporations, which themselves developed in two stages. These ideas require examination in some detail.

In 1991, twenty years after the release of Vernon's book, there was a special issue of the *Millennium Journal of International Studies* reappraising his work in light of subsequent developments. Vernon (1991:193) himself states that gradually

governments are becoming reconciled to a modified concept of sovereignty in the economic field....Under the compelling power of the computer they are creeping up to creating global standards in the various branches of telecommunications activity.

Vernon still maintains that there are ways in which nations and transnationals are both useful to each other, despite mutually antagonistic features. It is unlikely that these tensions between nations and transnationals will go away: "The communications revolution is inexorably intertwining national economies, confusing national identities and redefining the limits of national sovereignty" (195).

Unfortunately, the overall importance of the role of communications in the development of the transnationals has not been generally realized. One reason is that researchers in international relations have had a hard enough time accepting that transnationals are as important as nation states in their field. These researchers

refuse to see that the relations between states is but one aspect of the international political economy, and that in that international political economy, the producers of wealth —the transnational corporations— play a key role. To do so would upset too much of their received wisdom (Strange 1991:246).

The importance of communications technologies to transnational corporations can be discerned if we look at the history of the transnationals. Prior to the development of the transnationals, international trade was just that — trade. It was based on the import and export of raw materials or finished products and followed the principles of the market economy. This system of international trade worked as long as trade volumes were low and there was no significant overseas production (Vernon 1971:125). Such a system worked sufficiently well while communications were limited and slow since prices, products, and markets remained relatively stable. Then, as markets grew,

corporations set up overseas production facilities (Vernon 1971:125). This was what economic historians call the 'Golden Age', 1945-73. During that period, growth "occurred at more than twice the rate of any equivalent historical epoch" and global trade grew "at more than twice the rate of output. The growing global integration of production in the post-war period was reflected, and indeed partly caused by, the operations of these TNCs" (Kaplinsky 1991:257). These same post-war years were also the years of massive advancement in communications technology. This enabled the transnationals to continue their expansion without encountering the usual diseconomies. According to Vernon (1971:126), new "capabilities for scanning and responding were at work inside the firm" which allowed the emerging transnationals to deal with their massive expansion by setting up an international division in the home country while leaving the overall corporate structure relatively unchanged.

As long as such a division was not outsized by comparison with the others in the enterprise, its constant needs for communication and coordination with the others could be tolerated and accommodated in the organization's picture. The endless problems of product design, pricing policy, quality control, research support, and so on could be dealt with as part of the ordinary process of interdivisional communication. (127)

Even though diversification and expansion continued, the telephone and other simple communications technologies were able to maintain control of the transnational; at this stage "discipline and coordination are maintained much more by common training and conditioning than by a stream of commands from the center" (134). Nevertheless, this golden age stage is also characterized by a continued emphasis on mass production where the production units merely become geographically distinct and the transnational increasingly trades with itself between divisions. But, as the golden age drew to a close,

"this pattern of accumulation began to falter and productivity growth [began] to slow in those firms and economies that persisted in pursuing this strategic orientation of mass production" (Kaplinsky 1991:259). What emerged next has come to be generally referred to as post-Fordism. Post-Fordist production is characterized by flexible production, simultaneous engineering, just-in-time delivery, and niche marketing (259-61, 264). The organizational restructuring that takes place in the shift to post-Fordist production is heavily dependant on communications and, I would posit, requires the fine degree of coordination and control that only instantaneous computer-mediated communications allow. That the end of the 'golden age' and the rise of post-Fordist production coincides with the development, and increasing availability, of computer communications technology is not a coincidence. Thus, as long as the history of the development of transnational corporations is taken into account, it can be seen that their consolidation into the familiar form of today was dependent on, and facilitated by, the development of computer-mediated communications. That this current model for the transnational is at least somewhat antagonistic to the formal characteristics of the nation state is widely agreed upon (Eden 1991:189).

In a similar way, the changes in epistemology away from logical positivism and Cartesian dualism and toward the mythopoetic content favoured by fully articulated electronic media are balanced by the rise of McLuhan's retribalized mass who, because they all share the same media-mediated experiences, come to have a collective consciousness restructured around more tribal oral norms. Myth and ritual become containers of cultural wisdom, a group identity arises and mind body dualism begins to

decrease. Even the rule of law begins to fray around the edges as competing interpretive frameworks call into question the idea of a single knowable truth. Further, the epistemology of science begins to be questioned as, in Kuhnian fashion, the growing weight of the various critiques and challenges begin to tell. It must be noted, however, that these trends are associated with the transitional analog stage of the electronic mode of communication.

In *The Condition of Postmodernity* David Harvey (1989:49) discusses how Jean-François Lyotard

situates the rise of postmodern thought in the heart of what he sees as a dramatic social and political transition in the languages of communication... The problem, however, is that knowledge can now be coded in all kinds of ways, some of which are more accessible than others. There is more than a hint in Lyotard's work, therefore, that modernism has changed because the technical and social conditions of communication have changed.

Therefore, the postmodern condition could be thought of as the social convention of the first analog aspect of the electronic mode of communication — what I prefer to call post-literacy. My choice of this nomenclature is, as much as anything, meant to distance my analysis from the controversial connotative baggage of the term postmodernity and allow me to subsume the entire postmodern discourse under the headings of my framework.

As such, then, the analog phase of the electronic mode of communication is characterized by the instability caused by the simultaneous action of the competing impulses of literacy and post-literacy. Individual identity in this phase is structured as a fragmented subject. This subject is transparent and unstable. It is a multi-levelled, many-sided, mutable and morphing abstraction. Everything is problematized: interior/ exterior,

mind/ body, desire/ action. The emphasis is on 'having, rather than being'. This mirrors the links between the analog stage and commodity fetishism. In this state, the body is a gestalt, existing as a discrete set of relativistic space-time events —appearing and disappearing sequentially— as a mere component in multiple large systems which are loosely arrayed in a quantum space, governed by random process and statistical probability. Social relations are disjointed and lack stable structure. Everything changes — all the time. Huge swings and oscillations predominate over equilibrium. This is the culture of Kroker's panic phenomenon (Kroker, Kroker and Cook 1989). The structuring metaphor of this culture is environmental: "When a new factor is added to an old environment, we do not get the old environment plus the new factor, we get a new environment" (Meyrowitz 1985:19). As the new factor interacts simultaneously on many levels, it produces a whole new set of interactions and interrelations. The object and subject become interpenetrated. The theoretical construct in this postmodern phase is systems theory or cybernetics. Information becomes valued. This level of the information pyramid is suited to facilitating the constant negotiations and renegotiations of thought required of the unstable subject existing in an unstable world.

Some support for this contention is offered by Harvey, who has also observed the connection of electronic epistemology with postmodernism and finds it hard "not to attribute some kind of shaping role to the proliferation of television use." He too has noticed the link of postmodern surfaces to TV and extends this idea:

Television is also, as Taylor (1987, 103-5) points out, 'the first cultural medium in the whole of history to present the artistic achievements of the past as a stitched-together collage of equi-important and simultaneously existing phenomena, largely divorced from geography and material history

and transported to the livingrooms and studios of the West in a more or less uninterrupted flow.' It posits a viewer, furthermore, 'who shares the medium's own perception of history as an endless reserve of equal events.' It is hardly surprising that the artist's relation to history (the peculiar historicism we have already noted) has shifted, that in the era of mass television there has emerged an attachment to surfaces rather than roots, to collage rather than in-depth work, to superimposed quoted images rather than worked surfaces, to a collapsed sense of time and space rather than solidly achieved cultural artifact. And these are all vital aspects of artistic practice in the post-modern condition (Harvey 1989:61).

And what of cultural practices? Very likely similar relations obtain.

When postmodernity is understood as an environment that corresponds to an electrical epistemology brought about by the dominance of analog electronic communications media, the crucial point to be noted is simply that it no longer matters which of the multiple stories is true, which of the fractured realities is the real one. When culture undergoes "the dissolution of life into TV" (Baudrillard 1983:55), all of the possible/plausible stories could be equally true. Nevertheless, modernist scholars continue to apply outmoded canons of evidence to information that is coded in an entirely new way. Do we ask if a contemporary TV commercial is "true"? This truth about multiple truths tells us all we need to know about postmodernity. The "facts" of any narrative, whether fictional, scientific, theoretical, or other, are today laden with an overabundance of truth. This stems from the fact that society is in the process of going full circle from oral/tribal conceptions of multiple truths that must be mediated, through modernity's limited and rigidly policed definition of print-based truth as objective and unchanging, into a postmodern conception of truth as not so much relative as multiple, relational and multi-faceted.

By way of illustration let us consider the assassination of president John F. Kennedy. It doesn't matter who "really" killed JFK. What is far more significant is that it could have been *any* of the culprits pointed to in the major theories: the CIA, the mob, the Russians, the KKK. We will never know for sure. Understanding this lesson tells us far more —yields far more information or meaning about life in the contemporary world— than any story rooted solely in a single truth with a single culprit.

Therefore, to reiterate, all that really matters in the analog stage of the electronic mode of communication is that it really does not matter which story is true. Paranoia is the only rational response, and the only way to deal with the postmodern condition is through a strategy of mediating conflicting contingent realities through multi-faceted, multi-levelled reasoning.

The Digital Phase

It is not until the beginning of the second, digital stage of the electronic mode of communication that the diverse processes of social change begin to consolidate and to produce a cultural form more-or-less tribal in nature and underpinned by a return to primary orality. This phase began with the world's first electronic digital computer, ENIAC, built in 1946. We are only just beginning to be able to discern the earliest indicators of this process. For example, Richard Lanham (1993:xii) notes:

Copyright law is based on print. It was invented when print was invented, in order to protect it. It has been stretched to protect images and sounds but the stretching has always shown, and now electronic text breaks the intellectual fabric down completely.

Like McLuhan, Lanham does not distinguish between the analog coding and the digital coding of information. What he is referring to here is actually digital text.

At this point, it may be useful to digress in order to discuss some additional aspects of the digital mode of communication.² First, it is important to point out that even though a computer may display text on a video display terminal (VDT) as its main interface, a VDT is based on essentially the same technology as television. Thus, people engaged in reading computer text are in a sense *still watching TV*. And, to the degree that this is true, all of McLuhan's principles about television being an oral/aural medium hold true, such as it fostering participation in depth and scanning for pattern recognition. Perhaps this explains why the members of our 'Interrogate the Internet'³ reading group unanimously felt that the MUD experience was *more* intense than the "live" experience of playing the role-playing game Dungeons and Dragons (D&D) (forthcoming). An earlier essay by Stone supports this contention in its discussion of the intense involvement of participating crews in a networked army tank simulator despite crude, low resolution graphics on the screens placed in the tank's viewports. The designers themselves believe

it may be the lack of resolution itself that is responsible, since it requires the participants to actively engage their own imaginations to fill the holes in the illusion! McLuhan redux. That it works is unquestionable. When experimenters opened the door to one of the simulators during a test run

² If the split of phonetic writing and typography led to social forms as disparate as feudalism and modernism, then the split of analog and digital electronic media could have equally momentous cultural consequences which I feel, for reasons of convenience, justifies the use of the term digital mode of communication.

³ Part of my research was focused around the 'Interrogate the Internet' reading group which Wade Deisman, a Ph.D. candidate in Sociology at Carleton, and myself started in order to facilitate a critical re-examination of issues in computer communications by academics who are experienced users of the Net and who are doing research on the Net. The interdisciplinary group was formed in January 1995 and continued to meet until the end of the winter term.

to photograph the interior, the participants were so caught up in the action that they didn't notice the bulky camera poking at them (Stone 1991:93).

Second, there is also an overwhelming tendency when discussing digital media to conflate the terms "digital" and "binary". While transcendent reality is an analog concept, all typologies are quantum in nature — discontinuous by definition. All that is necessary for a digital computer is that the internal states of the machine are discrete and quantum in nature. All contemporary digital computers work with base-two or binary logic. All information is reduced to a code that has only two possible states, on-off or zero-one. This is a quantum system but *it is by no means the only quantum system* since all bases are systems of quanta. In base ten, for example, this is represented by the integers: 0,1,2,3,4,5,6,7,8,9.

However, a digital computer need not be binary, and other bases such as base three or higher are theoretically possible. Thus, the binary system is merely one possible member of the set of all bases that could theoretically be used in a digital computer design. Indeed, some experimentation with non-binary digital computers has been attempted. In any case, this possibility has been explored in science fiction. Robert A. Heinlein (1973:99) based one of his computers on trinary or three-state logic. One may speculate, using the tenet of convergence, that the future of the digital mode of communication lies in the development of non-binary, probably parallel, digital systems, since current thinking holds that the human brain contains both digital and analog components (Gruber 1994:111). If this is correct, then we have truly only taken the first halting steps toward the realization of the digital mode of communication.

Finally, I would like to point out that the preceding point is paralleled by Bateson's discussion (1979:49-53) of the difference between number and quantity. Since I am assuming that computers will likely undergo a form of convergent evolution with life processes, it may be worth remembering that Bateson notes that nature's expression of number, which is a digital quality, seems to be limited to at most five or six. This then, may save some time when considering which numerical bases to attempt to use for non-binary digital computers.

Because the analog and digital phases of the electronic mode of communication represent a subdivision similar to that made between written and typographic phases of literacy, the distinguishing characteristics are often not distinct. Thus, for certain realms, the differences are minimal. However, there are a few points worth making here. For instance, in the transition from analog to digitally-coded information, the schizoid, fragmented personality of postmodernity tends toward a more psychotic formation. For the psychotic, the only real thing remaining is the self, while all else becomes surreal and increasingly suspect. This parallels the attendant shift from simulation to hyperreal simulation (Baudrillard 1983). The value of 'having' information gives place to 'having had it flow through you' — of having been a conduit for information.

Lastly, in what is possibly a general rule, each stage of the taxonomy foreshadows the next in the relationship of spatial metaphor to individual identity. Hence, the stable gestalt identity of the tribal form exists in Cartesian space. The Cartesian subject exists in relativistic space. The fragmented, relativistic subject of postmodernity exists in quantum space. This leads to the speculation/prediction that the psychotic, quantum

identity of the digital phase will exist in a black-hole-like singularity where time and space become meaningless and frozen. This space-time is postulated as essentially unstable and, perhaps paralleling the big bang, might explode into a new historical cycle beginning again with the tribal gestalt "normal" identity that exists in Cartesian space.

The question remains, what will the characteristics of this newly emerging digital mode of communication be? I hypothesize that as the convergence and the consolidation of digital computer-mediated communications proceeds towards its culmination in a single, pervasive digital medium of communications, effects in the wider social and cultural realms will become prevalent and will tend to move what I have termed post-literate culture in the direction of a more purely oral culture — in short, toward a primary orality.

Yet, it remains that in this late stage of primary orality, print literacy will not be entirely abandoned, even if the book lives on only as aesthetic object. This fate has already been predicted in the high-tech, futuristic culture created by the popular TV show *Star Trek*. Oral norms will predominate, even in the remaining written communications. The mythopoetic nature of some postmodern literatures may be seen as a step in this direction. In fact, most of the effects of the change to digital media are already discernible in their embryonic form. As the essential instability, replicability, and leakiness of digitally coded information gradually undermines literate assumptions about stable texts and knowable truths, the process of change will accelerate toward consolidating increasingly tribal social values. Much in the way that biologists consider the frog to be an 'indicator species' for the stability of a given ecosystem, the domains

of Law and Education provide diagnostic utility for distinguishing early trends in social change provided that the "noise" of paradigm shift can be filtered out by the judicious use of the appropriate analytical framework. In this case my outline of the historically-specific modes of communication provides such a frame. Thus, the law, a realm where a culture maintains its definition of Truth, is a good indicator of these changes, as is the sphere of education which is concerned with the (re)production of core cultural values. Consequently, as digital media attack concepts of copyright, intellectual property, and the very idea of a rule-of-law based on written statute and recorded precedent (McLuhan 1964; Gozzi and Haynes 1992:220; Lanham 1993), the law will presumably become increasingly concerned with mediation and balancing. Meanwhile, education will, hypothetically, become concerned with process rather than product and pattern recognition rather than the participation-in-depth demanded by the content-oriented literate form of education which Freire (1970) has termed "banking education."

Having outlined the general historical development of the various modes of communication up to the present stage, where the digital mode is beginning to dominate, the next step is to further elucidate the underlying processes and implications of digitally-coded information. This forms the theme of the following chapter.

Chapter Three: The Effects of the Digital Mode of Communications

Marshall McLuhan believed that the one person in society who could perceive and correctly predict the imminent effects of new media was the artist. The artist was "the only person in the culture whose whole business is the retraining and updating of sensibility" (McLuhan 1989:5-6). However, McLuhan held no brief for the 'art world'. The "bureaucracy" of art functions in marking class distinctions (1964:65). His interest lay in a vision of art as "exact information of how to rearrange one's psyche in order to anticipate the next blow from our own extended faculties" (1964:66). Given this schema, McLuhan interpreted the role of 'artist' rather broadly and somewhat differently from the usual interpretation. His definition of the artist is as the person "in any field, scientific or humanistic, who grasps the implications of his actions and of new knowledge in his own time. He is the man of integral awareness" (65). I have tried to draw on McLuhan's insights in preparing this chapter. Thus, some component of an aesthetic sense is requisite for conducting an inquiry such as the present one, which seeks to illuminate the emergent effects and implications of the shift to a digital mode of communication.

The speculations and predictions made here are informed by the analytical framework of the mode of communication proposed in the previous chapter. The chapter following this one is intended to provide empirical evidence in support of the contentions contained herein. This task is undertaken in the spirit which McLuhan intended when he said "in the electric age there is no longer any sense in talking about the artist's being ahead of his time. Our technology is, also, ahead of its time, if we reckon by the ability

to recognize it for what it is" (1964:65). Accordingly, I seek not profound or long-term prediction but only to make sense of the extremely rapid changes that are happening everyday, and, in many cases, have already overtaken us without their momentous consequences being recognized. Hence, one useful technique for demonstrating the effects of the digital mode of communication is to contrast it with those of either print or analog electronic modes.

For example, Neil Postman (1985:64-65) discusses how the development of the telegraph is fundamentally implicated in the historic change from what he calls the "Age of Exposition" to the current "Age of Show Business", which corresponds to my shift from a literate to an analog mode of communication. He maintains that three "demons of discourse", irrelevance, impotence and incoherence, were encouraged by telegraphy, which

... gave a form of legitimacy to the idea of context-free information; that is, to the idea that the value of information need not be tied to any function it might serve in social and political decision-making and action, but may attach merely to its novelty, interest, and curiosity.

It is quite clear to Postman that the telegraph "made information into a commodity". He suggests that it is possible to get a feeling for what it is like to live in an age of commodified, context-free information by asking yourself a question:

How often does it occur that information provided you on morning radio or television, or in the morning newspaper, causes you to alter your plans for the day, or to take some action you would not otherwise have taken, or provides insight into some problem you are required to solve? (68)

I agree with Postman's assertion (68) that: "In both oral and typographic cultures, information derives its importance from the possibilities of action". Malinowski also

"made the point that among 'primitive' (oral) peoples generally language is a mode of action and not simply a countersign of thought" (Ong 1982:32). The analog stage of the electronic mode of communication, which was ushered in by the invention of the telegraph, is characterized by the "diminished social and political potency" caused by the separation and abstraction of the connection between information and action. This gulf between information and important action may be highlighted by again asking a series of reflexive questions:

What steps do you plan to take to reduce the conflict in the Middle East?
Or the rates of inflation, crime and unemployment? What are your plans
for preserving the environment or reducing the risk of nuclear war? (68)

Almost none of the information broadcast through the electronic mass media is translated directly into action on the part of most people.

This condition seems to characterize also the current status of the computing power of the Net. It is possible that important information that materially affects people's lives does pass through the Net, but I believe that at best this type of information tends to follow the more private channels available, such as email, and that even there the potential for action is minimal. The introduction of digital CMC has caused a separation of the commodity and novelty functions of electric information. The privately controlled corporate digital information-flows are pure commodity, while the vast majority of the information carried by the more public Internet counts, for the huge majority of people, merely as distracting pastime or novelty.

It is now generally accepted that a large flow of information becomes a problem in itself. After a certain threshold, information becomes something to be screened,

filtered, sorted, even avoided. Under these conditions the filtering process tends, to a greater or lesser degree, to be automated. When this happens, the cognitive universe of the person who acquires much of their information in this way is subtly altered. The stage of information overload was reached before the beginning of the digital mode of information. However, analog media tend to be serial also or beyond the control of the individual. This lack of interactivity and control means the predominant response to overload becomes one of numbness — either partial or total shutdown of the faculties. Digital media are capable of handling vast amounts of data increasingly quickly. As digital media spread, the point is finally reached where people change from dealing with information through participation in depth —encyclopedism— to a mode of scanning data to facilitate pattern recognition. Although McLuhan described this change more than twenty years ago, it is only now that it becomes the predominant pattern. This is only one of the significant effects of the shift to a digital mode of communication which will have extensive repercussions as the effect slowly spreads out and affects all aspects of culture. One place this particular effect is highlighted is in the university, where a new tension arises between the primary literacy of professors and the reluctance of students who, while formally literate, no longer approach their scholarship with the same emphasis on the meticulous exposition of thoroughly researched subject matter. The endemic complaints of professors and attempts by departments to come to grips with this disjuncture points to the significance for culture at large of this change to pattern recognition fostered by digital media.

The biggest unquestioned, underlying assumption of the so-called information economy is that more information is always better. "Thus, a central thesis of computer technology —that the principal difficulty we have in solving problems stems from insufficient data— will go unexamined" (Postman 1985:161). This is the same presupposition that the industrial economy rests upon — more is good. More money, more production, more exchange, more consumption — and our problems will be solved. These assumptions are increasingly being challenged in the area of industrial production, but those same assumptions have been carried over unquestioned and unexamined into our thinking about information. In this light, the computer and information revolution may be seen as not the next stage after high modernism, but instead the rescue of it. Once again, salvation lies in the future, is brought to us by mass production and technology, and is the result of "progress." This is especially true when we remember that all of this wonderful digital technology and software is itself an industrial product of the post-Fordist era which may possibly offer the salvation of the military-industrial complex. In 1985 the computer industry made up eight percent of the US Gross National Product (GNP) and was already "larger than both the steel industry and the auto industry" (Yourdon 1986:5) with high growth rates projected into the foreseeable future.

Computers and computer-mediated communications may help handle, process, correlate, and distribute information efficiently but, as technologies, they will never reverse the relation where Bateson points out: "For all objects and experiences, there is a quantity that has optimum value" (1979:54). Bateson continues by saying: "Above that quantity the variable becomes toxic. To fall below that value is to be deprived" (54).

Bateson shows how both too little and too much are problematic circumstances. Now that the information revolution is supposedly upon us we must extend our investigation into the possibility of "toxic information", which is exactly what Stewart Brand does in his book *The Media Lab* (1987:258). In order to avoid the pitfalls of unquestioningly accepting the value of progress in an information economy, it is necessary to examine the negative side of an economy based on the production of information. Every technology has both positive and negative effects but when dealing with computer communications, discussions of the negative effects get lost in all the hype. What little discussion does take place has by far been focussed on the effects of the content of computer communications. Brand is guilty of this as well; his discussion centres around content issues such as "pornography or enemy propaganda". Because of this focus, he predictably has difficulty going anywhere with his analysis beyond noting the complexity and relativistic nature of the issue. The problems that might arise from the mere presence of CMC need to be explored in detail. Brand almost comes close to this viewpoint when he tells us

I'd like to see some enterprising Media Lab student fabricate an utterly persuasive video of the President of the United States —his worried face, his forceful voice— giving a broadcast beginning, 'This nation is at war'....Preventive maintenance begins with the question, 'What's the worst that could happen?' We haven't begun to ask. (259)

It is not the content that Brand suggests here that is significant, rather, it is the fact that digital media throw all issues of truth and authenticity into question. It is not the President of the United States' reality that is at stake as much as it is the mundane level of everyday reality that is threatened by the very presence of digital media.

While I agree about the urgency of this project of asking what is the worst that can happen, focussing on the toxic possibilities of information *qua* information is the more important task. This work is now beginning to be undertaken. The Michael Crichton book and movie *Rising Sun* raise many of the issues of the effects of digitally coded information, but, they did not raise any significant public debate about the effects of digital media. Instead, public attention has focused on content issues much as Brand did.

Decades of research into the effects of violence on television have produced little conclusive evidence. For overviews of this literature see Pearl, Bouthilet and Lazar (1982) and el Khatib (1991). McLuhan pointed out long ago that the project of looking for efficient cause in the relationship between television content and viewers is misguided and doomed from the outset due to the analogical, mythic, aural/oral structure of television (McLuhan 1964:314; McLuhan and McLuhan 1988:86-91). "Electronic media are *received* media. Print is a *perceived* medium" according to Tony Schwartz (1981:17) who developed the resonance theory of communication. He has shown how electronic media have usually been treated as a simple extension of print,

subject to the same grammar and values as print communication. The patterned auditory and visual information on television or radio is not 'content'. Content is a print term, subject to the truth-falsity issue. Auditory and visual information on television or radio are stimuli, electronically mediated communication cannot be analyzed in the same way as print 'content' (Schwartz 1973:19).

Remember here the futility of asking if a TV commercial is 'true' or not.

Similarly, digital media must also be approached as stimuli which, as such, are not subject to evaluation based on ideas of efficient cause. Hence, it is unlikely that

looking for negative effects due to toxic content in digital media, such as bulletin board services (BBS), will be any more successful than the similar examination of TV content. In that light, it will be worthwhile monitoring closely the litigation surrounding these issues, such as the charging of BBS sysops —some as young as 14 years old— with the distribution of pornography because they allowed digitized pictures of nudes, called .GIF files, to be uploaded to their computers (Abraham 1994:B1). Unfortunately, content-oriented issues such as these are beginning to dominate the public discourse about digital media.

One effect of the change to a digital mode of communication and its attendant shift towards orality will likely be a slow replacement of the single-minded focus on content by an awareness of the effects of digital media at the formal level. Again, this shift alone will be associated with large transformations in culture and consciousness.

Art and Digital Reproduction

Let us return to the theme of art as a diagnostic procedure for discerning the effects of new media. Let us apply Walter Benjamin's classic 1936 analysis of *The Work of Art in the Age of Mechanical Reproduction* (1968 [1936]) to the shift to a digital mode of communication.

Walter Benjamin was an extraordinary man in many ways and according to one of his biographers "should be viewed as a twentieth-century anachronism, the last representative of a vanishing species: the authentic European *homme de lettres*, someone for whom philosophy and literature are not mere parlour games, but for whom these

serve as the focal point, the *raison d'être* of life" (Wolin 1982:x). Benjamin lived from 1892 until September 1940 when he killed himself at the Spanish border after failing to secure his escape from Nazi-occupied France. He travelled extensively, having fled from Germany after Hitler seized power, and spent a significant period in Paris where he eventually developed his critical interest in reception aesthetics. Benjamin may be viewed as a supremely literate man forced to live as a nomad who personally experienced the period of the introduction of the cinema which was one of the most powerful of the new electro-mechanical media. His insight into the effects of these media and the critical tone of his work makes it easy to adapt as a guideline to a similar analysis of the introduction of digital media, potentially allowing some of the hidden issues of the rise of the digital mode of communication to come to light. While the direct quotes from Benjamin's piece will be kept to a minimum, the following section is inspired by a critical reading of his work, previously undertaken with the idea of extending Benjamin's analysis into *The Work of Art in the Age of Digital Reproduction* (MacLeod 1994 unpublished).

Benjamin's 'age of mechanical reproduction' generally corresponds to my literate mode of communication, with the exception of those phenomena that are electronic, and therefore represent the earliest stages of the analog phase. The first thing to note is that "reproduction" is an apt descriptor for digital processes. One of the fundamental properties of digitally coded information is that it is predisposed toward reproduction and this reproduction results in a copy that is *exactly* like the original. The importance of this point cannot be stressed enough. The existence of digital reproduction represents

something entirely new in the history of humanity. The crucial distinction to grasp is that where digital reproduction is concerned *there is no original*. There may be a real world artifact that was originally digitally sampled, but once it has been digitized the status of the original is lost. Where is the *original copy* (surely a revealing oxymoron) of a computer program such as Wordperfect kept? Surely this is a nonsensical question.

Even cloning is an inadequate metaphor for the process of digital reproduction. Clones are identical genetically but develop in differing environments which, as in the case of identical twins, results in two differentiated individuals. In the case of digital reproduction, not only is the material the same but the *environment* —the coding process— remains exactly the same also. Not only is the content the same but so is the *form*. This degree of similarity is unprecedented and results in there being no difference between the putative original and the copy.

It is this relation between original and simulacrum that blasts apart the last shreds of the relevance of copyright. The only difference between the licensed copy of a piece of software and its "pirated" version lies in the exterior social world of legal sanction. The remaining problem is how to maintain a system of values upon which the capitalist class system can be maintained. In the age of mechanical reproduction, one solution was the practice of signing and numbering prints. It appears that the way found to accomplish this with digital reproduction has been through legislation — the licensing of some copies without originals as legitimate while declaring others, in no way different, to be illegitimate. This has worked so far, after a fashion, for computer programs and the like, but the full destructive impact of this solution is yet to be perceived. And, it is extremely

interesting to note that this system of regulating value has been accomplished through the introduction of an element to each copy that is different and unique — a *serial* number. What causes trouble for the software pirate is not the similarity of their copy but the lack of a crucial difference between their copy and another which, again, has had to be legitimated through an external social practice such as by mailing in a user registration card.

What "withers in the age of mechanical reproduction is the aura of the work of art" (Benjamin 1968:221). What withers in the age of digital reproduction is the original status of the digital work. What is left behind beyond the McLuhanesque break-point and reversal? The aura alone, detached and dissociated from the original? The only aura left then comes to reside in the copy. The trick becomes to consume the aura, the sign alone, and not the object itself. This is also the circulation of dead signifiers with no referents, valueless, essentially malleable, mutable, and unstable.

Take as an example the case of a music program stored digitally on a Compact Disc (CD). The playing of the digital CD makes the individual living room into the *only* original performance that exists. No other living room is exactly the same, therefore all other performances will also be originals. This relation holds to the point where even each new replay of the program material in the same room is a new original performance since the exact conditions of any previous performance cannot be recaptured and it must be remembered that digital media are not diminished by accessing the information stored in them. In the case of analog media there was always an original performance

somewhere, however removed and remote, which retained the cult value and aura and which the livingroom, or other, performance attempted to recapture.

This example also highlights the way digital media take to an extreme the relationship that is posited for complex systems: as the mean time between failures increases, the catastrophic nature of the failure also increases. With the old technology of record albums, the progressive wear of the record gradually introduced unwanted noise to the signal which might eventually surpass some threshold and make the record unlistenable. This threshold was context-specific and was not predictable; a teenager, for example, might tolerate a level of noise that an adult would not. In the case of the digital CD, as long as the data can be read from the disc there is absolutely no deterioration of the sound quality from one playing to the next. However, if the threshold is reached where the data cannot properly be read then no signal at all remains and the CD becomes useless. One moment all appears fine and the next there is nothing. This is another way that digital information is quantum: either it works, or, catastrophically, it fails. It is either on, or off. There is no static, no partial breakdown, no limping along on one engine as the pilots of the famous "Gimli glider" found out. Their brand new Boeing 767 was equipped with a state-of-the-art digitally controlled "glass cockpit" where all the instruments were CRTs. When, because of a computer malfunction, their plane ran out of fuel at 26 000 ft without warning, the pilots of the "Gimli glider" were faced with a life-or-death situation that simply would not have occurred in a more "primitive" aircraft (Hoffer and Hoffer 1989). Because at least the controls of the 767 were still mechanical, the plane was miraculously landed safely. However, similarly equipped planes today are

"fly-by-wire," where even the controls are routed through a computer. Thus, should a similar malfunction happen in one of these planes, the chances of survival are almost non-existent.

Two more crucial aspects of digital reproduction are the possibility of profoundly manipulating data without leaving any trace of the manipulation in the product or representation, and the absolute increase in speed offered by computers. In his attempt to deal with the rise of Italian Fascism, Walter Benjamin (1968:241) maintained that: "Only war makes it possible to mobilize all of today's technical resources while maintaining the property system." Society has been unable to harness the productive nature of technology for the common good, and this leads eventually to trouble. "If the natural utilization of productive forces is impeded by the property system, the increase in technical devices, in speed, and in the sources of energy will press for an unnatural utilization, and this is found in war" (242). In other words, because hegemonic power is driven by the profit motive, the natural productive forces of technology are limited. However, as technology continues to increase, the contradictions inherent in this relation build up to the point where Benjamin believes they will find expression through war. His finding is then linked to the rise of Fascism. Fascism

expects war to supply the artistic gratification of a sense perception that has been changed by technology. This is evidently the consummation of "*l'art pour l'art*"... [Humanity's] self-alienation has reached such a degree that it can experience its own destruction as an aesthetic pleasure of the first order (242).

If capitalist democracy deals with mechanical reproduction by the commodification of art and artifact as its natural utilization and war as its unnatural one,

then, digital reproduction will press for a different articulation since digital copies are difficult to commodify. If war has an aesthetic aspect and war is about property then it must result from the combination of property and visualist art as produced by the literate mode of communication. Accordingly, the digital mode of communication is characterized by a natural utilization equivalent to tribalism.

With digital reproduction what is truly new is hidden from view — its aesthetic is concealed as new figure quickly fades into ground (McLuhan 1988:5). Since the content of the new medium is the old medium, the final product of digital communication must still be displayed in the form of one of the older media: print, film, video, etc. This hidden nature of actual digital processes means that all digital reproduction dissimulates and the copy becomes the presence of an absence (Shields 1992). This makes the digital reproduction the perfect cult object since it is eternally removed — distant and unapproachable. Since there is always more going on than 'meets the eye' in the digital mode of communication, digital reproduction serves to hide rather than reveal the true nature of reality. McLuhan saw that with mechanical/electrical reproduction the human becomes a servomechanism to the machine. With digital reproduction the human becomes a part of the machine — both are interpenetrated by each other and become cyborg.

The emerging cyborg consciousness does not stand alone but is a wired-in consciousness that no longer merely apprehends art. A digital consciousness is always one step ahead. The contemplation of paintings of the literate mode of communication was replaced by participation in the analog stage of mechanical reproduction, film, and television. With the rise of the digital mode of communication, participation yields to

anticipation, as the subject/object dichotomy disappears and the part merges with the whole. When the mode of perception is reception, consciousness becomes oriented around prediction. Mind and data flow together and begin to act, react, and interact together as one. This is the subtle way of the cyborg. It is not necessary to actually place electronic devices within human bodies in order to produce a race of cyborgs; the growing dominance of the digital mode of communication is already producing them.

What remains of the power of the aura is supplemented by the power of simulation since the aura is now wholly supplied by the audience. But this s(t)imulated aura only serves to mask the lack of any real aura in the digital copy. The problem with anticipation as a mode of consciousness is that nothing outside of the generative model can be anticipated. What stands as art is stripped of the very function of art. Art becomes design and design becomes CAD, and consciousness is merely along for the ride as computer speed combined with the malleability of data cries out for a process orientation — the incorporation of temporal functions into production. What this means is that the computer represents the antithesis of the stable text and is *fundamentally predisposed toward animation*. If digital technology also presses for an unnatural utilization it will be one of perpetual revolution. War in such conditions will again come to resemble the tribal warfare of limited actions rather than the "total war" of the literate era as evidenced by the situation in former Yugoslavia.

With a digital mode of communication, both time and space become malleable quantities for consciousness to play with. Leonardo Da Vinci bound space in time by capturing Mona Lisa in oil. Mechanical reproduction spreads time out over space as

endless prints of the Mona Lisa proliferate until she is everywhere, all the time. Digital reproduction and its bias toward animation frees us from the limits of time and space. Take the Mona Lisa. Make her frown. Make her smile again. Now make her blonde. Make her come alive and, depending on who controls the model, she can either try to sell you something or patiently await further instructions.

The retribalized masses living in the global village associated with the digital mode of communication, like other tribal peoples, do not maintain a separation of form and function, style and content. In this situation, art becomes increasingly artificial and the artist remains as simply an outmoded social category soon to be replaced by the much less specialized shaman, or in this case technoshaman.

That is, apart from the other function of the artist as *producer* of the signs of class distinction. The class elites consume these signs in a desperate attempt to stave off the effects of retribalization by marking themselves, using the magical principle of contagion. Pilgrimage remains as the marker of class consumption which leads to the aura of authenticity as reappropriated away from the necessarily low-class, low-culture mass/mechanical reproduction. "Oh! The Mona Lisa is so much better in the original."⁴ (Subtext: I am cool because I could afford to go to Europe and consume the Mona Lisa experience thereby marking my class position.) For these class elites, retribalization signals a great loss since in tribal societies, leaders lead by dint of their leadership

⁴ I actually witnessed this scene where a class of students who had been talking about their various trips to Europe and parts more distant all responded to the above quote with unanimous nods and murmurs of agreement.

qualities and record of success as decision-makers, and even hereditary chiefs do not so much govern as lead.

Therefore, the "art" that does remain as a social category in the age of digital reproduction becomes tribal art — that is, tribal art understood as that which is called forth by the collision with colonialism. There was no tribal art prior to contact with the whiteman: no Inuit carvings; no Haida prints; no purely aesthetic commodities. Thus, as digital reproduction increasingly makes its effects known, the work of "pure art" will increasingly become defined around its irreproducibility: the giant canvas (*Voice of Fire*); the monolithic sculpture (*Traffic*, the Haida bronze canoe, the shanty town built outside Ottawa's art gallery); the work of art that incorporates the non-digitizable real and a temporal nature (the rotting dress of meat, multi-media performance art, pig carcasses encased in plastic).

However, this stage will eventually pass as digital reproduction reaches its zenith. After that there will be neither a social category of art nor a high culture/low culture distinction. Just as it was before the whiteman, rather than a world where art imitates life, it will be a world where art is life and life is art. "'We have no art,' say the Balinese; 'we do everything as well as possible'" (McLuhan 1964:66). This is an art so broadly defined it loses its boundaries in the speed of digital reproduction. It is tactile, audible, kinaesthetic, full of smells and tastes, and yes, full of sights also.

Tribal aesthetics has not had its use value separated from its exchange value. It has not had its symbolic value separated from its ritual value as functional object. It has not had its sacred function separated from its profane one. It has not had its style reified

over its substance. In short, tribal art unifies art's cult value and its exhibition value into a holistic singular expression. Digital art recoups the ritual function of art in that it allows the unitary experience of the mass to build identity, to build a common referential reality, to build group identity based on a common lifeworld, a classless gestalt — but one still characterized by heterogeneity within homogeneity. Tribal art as effect of digital reproduction merely adds to this the dangers of simulation.

The Status of the Author

Benjamin points to the historical development of the mass media which reach the point where, in principle, anyone could be filmed or published. He concludes that "the distinction between author and public is about to lose its basic character" (1968:232). This process, begun at the very dawn of the age of mechanical reproduction where the printed book was the first mass-produced item, reaches its apotheosis in the age of digital reproduction where the positions of author and public reverse. Whereas beforehand there was a singular author producing for a mass public, now there is a public of singularities all producing as a mass author. As every member of the audience becomes an artist working on the same digital database, the age of the stable text ends.

As the common digital reality is constantly digitally-edited and customized by the mass of authors, leaving no trace at all behind in the text, the realm of the mass public disappears into a multitude of scintillating fragments to be combined and recombined digitally into ever-changing subject positions. Now I am an author, now I am a part of this public, now I am no longer an author, now I am a part of that public, now I am

being reprogrammed..... As this tautological tension builds up, eventually the whole system reaches the point of hyperreal simulation.

A significant corollary of this state where the information base is subject to continuous and ongoing editing and restructuring is that *information becomes an ephemeral quantity*. Specific information becomes difficult to locate and is often impossible to relocate at a later time, given the interminably shifting nature of the cyberspace architecture. Search engines may somewhat alleviate this problem but not if the data in question have been removed altogether. Regardless, there is a human element of habit involved in recovering information which resists constant changes in the rituals of access.

Joyce Nelson (1987:144-56) has written extensively about the "elimination of aura" associated with electronic media. She traces its history back to Benjamin who noticed, in the earliest days of film, the beginning of the trend toward technology displacing the human where the actor loses his or her aura since "aura is tied to his presence; there can be no replica of it" (Benjamin 1968:229). Benjamin then noted (229) that when making a film, "the part is acted not for an audience but for a mechanical contrivance". Further, he concluded that:

The film responds to the shrivelling of the aura with an artificial build-up of the "personality" outside the studio. The cult of the movie star, fostered by the money of the film industry, preserves not the unique aura of the person but the "spell of the personality," the phoney spell of a commodity.

Thus, as the digital mode of communication eventually reduces the author to simple object, the artist becomes simply a programmer. The phoney spell of the commodity,

along with any remaining artistic merit, is then removed from the manipulator of the data and instead the cult value becomes attached to the technology itself — i.e. "I have a mini-studio" or "I did it using Hi-8 and a Video Toaster". Commodity fetishism becomes the newly valorized aesthetic of s(t)imulated desire, captured by the maxim "style over substance".

Hence, in the digital mode of communication, the part is acted *by* the digital contrivance. Agency comes to reside in the machine itself or at least in the machine-like cyborg part of the author-cum-programmer. All else becomes simply data or input to be manipulated at will. Warhol's '15 minutes', after a brief stop in the world of television and universal videocameras where each person's fame is reduced to 1.5 minutes, becomes instead, a digitally speeded up 1.5 seconds of fame — all that is needed for the digital sampling process to capture the original for all time before discarding it as "data trash" (Kroker and Weinstein 1994).

Various permutations of this issue now confront the legal system. The appropriated texts of Kathy Acker are one example. The case of the 'musician' who sampled *all* of the characteristic sounds made by the heavy metal rock group Metallica, loaded them into a synthesizer, and then proceeded to compose a brand new "Metallica" song is another. The question of whose "work" this is becomes complicated. If I were to take a piece of audio tape and physically cut it up and rearrange the bits and pieces into a "new" work then I would be credited with the authorship of the resulting tape. This situation brings to mind the very real dangers of approaching media that look familiar, but are actually digitally coded, in a thoughtless manner and with the same old

assumptions. The surfaces of digital video, digital sound, digital text, may all look familiar but in reality they are entirely new media with different characteristics and principles behind them.

Gender and Digital Media

One thing that has not yet changed in the move to a digital mode of communication is the gendered nature of media. Ever since the end of the balanced oral mode of communication, the dominant media have reflected a masculinist bias. For example, Benjamin uses film extensively as his illustration of mechanical reproduction. Film has been shown to represent the male gaze (Mulvey 1975), as has portraiture in painting (Berger 1972). Today, the majority of the people using computer-mediated communications are male (Rheingold 1993:150), which means that media in the age of digital reproduction are still gendered. However, the meaning and characteristics of gender may still come to be quite different as more women find their way onto the Net. It is possible that eventually as the effect on identity of the fluidity of a process orientation reaches its limit, gender and sex may again become more distinguished from each other than they are today. Perhaps this will again bring us closer to tribal societies where social roles are not necessarily linked to sex. The examples of couvade, berdache, and the different meaning associated with cross-dressing in some tribal cultures come to mind.

Dangers of Simulation

Benjamin discusses another trend begun with mechanical reproduction which reaches its peak with the transition to a digital mode of communication. He addresses the issue of the ability of technology to open up whole new worlds previously unexplored:

With the close-up, space expands; with slow motion, movement is extended. The enlargement of a snapshot does not simply render more precise what in any case was visible, though unclear; it reveals entirely new structural formations of the subject. So, too, slow motion not only presents familiar qualities of movement but reveals in them entirely unknown ones . . . Evidently a different nature opens itself to the camera than opens to the naked eye — if only because an unconsciously penetrated space is substituted for a space consciously explored by man (1968:236-7).

Here Benjamin discusses the fractal nature of reality. As one examines the world in ever greater detail, ever greater complexities of structure and function appear; therein lies the danger of digital reproduction. Reality is transcendent, while digital reproduction is always based on a modelling of reality which inevitably has limits of resolution. The model is never complete, the map cannot be the territory. When we study the model we cease studying reality.

However, computer graphics go beyond the level of surface reality allowing perspectives that are impossible in nature but where the simple appearance of reality is taken as reality — hyperreality. When simulation reaches the level of the hyperreal, even natural objects become vulnerable and the representation of reality is supplanted by the suppression of reality and art becomes artifice. Granted the useful applications of computer modelling and virtual reality (VR), such as the exploration of molecular dynamics with force feedback VR systems (Rheingold 1991:26-29). Nevertheless, the

danger is ever-present that the experiment will eventually push the simulation beyond its level of resolution. Even though the results then cease to have any validity, the power of the simulation masks this failure. This is known in one guise as the spherical chicken syndrome (Kaye 1989:16) — so named when one researcher got into design troubles for forgetting that, for reasons of simplicity, the chickens in a design simulation for the ventilation system of a large chicken factory had been assumed to be spheres radiating a uniform level of heat.

This propensity of digital reproduction to produce reductionist analysis is self-defeating. A response of pushing the limits of resolution *ad infinitum* does not eliminate the problem. Art in the age of digital reproduction is not about life. That is not to say we cannot learn about life any more or that the function of art has been lost, but, rather, that in the world of the digital mode of communication it will be necessary to *constantly* remind ourselves to update our models by leaving the digitally mediated world of cyberspace and sampling transcendent reality anew.

Having now explored the implications of the emerging digital mode of communication in as much detail as seems prudent, the remaining task is to offer enough empirical support to convince the reader that the preceding analysis is indeed accurate. It is to this task that the next chapter is dedicated.

Chapter Four: Empirical Evidence and Analysis

In this chapter I present empirical evidence which I believe supports my contentions about the implications of the proposed shift to a digital mode of communications. This evidence comes from three sources: the available literature, my informants, and my own exploration of the Internet. I privilege my reflexive analysis of the process, where I began as a "newbie" in the world of computer-mediated communications and over the course of a year-and-a-half sought to investigate this world in as much detail as possible.

My inquiry involved the broadest possible conception of computer-mediated communications, given my acceptance of the convergence hypothesis for digital media, but nevertheless, tended to focus on the Internet. I chose to treat the Internet as an actual field site in this survey, which meant that I did not attempt to contact in person the people I met online for further research purposes. The rationale for this decision is that the vast majority of the inhabitants of 'cyberspace' never meet face-to-face, and therefore this choice enhanced my decision to treat the Internet as a cultural site for participant observation. There is an ongoing debate about the issue of whether or not it is appropriate anthropological methodology to attempt to meet online informants face-to-face. This is fascinating in its own right, but its resolution is not germane to the methods used in this study. Thus, I refrain from addressing it other than to discuss the one point I feel is important to this project.

It is a sign of the uniqueness of the cultural space created by computer-mediated communications that I, as anthropologist, am able to act simultaneously as a 'marginal native' doing participant observation, and as a full-fledged member of this emergent cultural group. In fact, given the lack of meta-communication, in the absence of a conscious effort to mark myself as an anthropologist I was invariably taken for a native. This circumstance is in one sense fortuitous indeed, but in another, it imposes an additional ethical burden upon the ethnographer towards full disclosure that is usually not an issue for most anthropologists. The result of this constraint is that the distinction between public and private communication on the Net is highlighted. Again, there is ongoing debate about privacy on the Net, but it appears that in most cases the issue of online privacy is handled through analogy to other media. Thus, email is considered privileged private communication while postings to newsgroups are treated as public speech.

I have maintained these distinctions in reporting my research, while adopting the conservative attitude of not including material from communications that were not clearly public, or were not expressly cleared for use by those involved. This did not limit my material because the volume of communications on the Internet, and the astonishing ease with which these communications may be recorded,⁵ ensured that there were multiple

⁵ All that is required to collect complete transcripts of online communications is to activate a capture function on your computer before beginning to interact with people. These transcripts are in machine readable form from the very outset. However, I felt the general application of this practice was in the ethical grey area. Therefore, I refrained from using this technique because, as I am sure any anthropologist knows, once data is collected there may be a temptation to use it while its misuse becomes a distinct possibility. Instead, I limited myself to using capture only with interactions with automated agents; saving cleared email messages; and mailing to myself copies of the interesting postings that could be considered public.

examples available to illustrate any points made. At worst, these decisions may have introduced a subtle bias to my reporting, but given the impossibility of being comprehensive, and the opportunity to report on sensitive issues through my parallel work with informants, I do not feel that this has been the case. I have privileged my reflexive reporting on the Internet as both the result of participant observation conducted by an ethnographer *and* as the report of a native key informant.

As for my other informants, I conducted informal interviews with nine people whom I already knew, from other contexts, were experienced users of computer-mediated communications. Given the ease of communicating through email, these interviews often evolved into somewhat long-term, sporadic, ongoing discussions once the frame had been established. In most cases I simply announced that any of our discussions about computer-mediated communications could end up in my thesis and that the individual concerned would have to notify me of material they did not want included. I recommend this arrangement. It parallels the familiar social relationship between a journalist and his or her sources, which most people adapt to easily with the "off-the-record" convention, and which has a proven history. Furthermore, because of my formalist bias in looking for the effects of computer communications, sensitive issues rarely came up.

In terms of my reporting on this material I have adopted the convention of referring to all of the people I interviewed as "my informant" or "my informants". I adopted this strategy because of my acceptance of the recent post-modern critique of ethnography, which maintains that regardless of what strategy the ethnographer adopts

in the attempt to "give voice" to his or her informants. the anthropologist is the one who retains the authorial authority over the ethnographic text.

Stephen Tyler (1986:128) addresses this question:

Some ethnographers have tamed the savage, not with the pen, but with the tape recorder, reducing him to a "straight man," as in the script of some obscure comic routine, for even as they think to have returned to "oral performance" or "dialogue," in order that the native have a place in the text, they exercise total control over her discourse and steal the only thing she has left — her voice. Others, in full and guiltless knowledge of their crime, celebrate it in "ethnopoetry" while the rest, like Sartre, their faces half-turned from the offending pen, write on in atonement — little finger of the left hand on the "erase" button, index finger on the "play" button—in the sign of the cuckold-counterfeiting voice in text.

Professor Rob Shields refers to people who have been represented in this way as having been "ventriloquized" (personal communication). Consequently, given the usual practice of protecting the identity of informants, I prefer to remind the reader as explicitly and continuously as possible who it is that wields the final authorial authority of the present text by referring simply and constantly to "my informants".

Ubiquitous Computers

There are two interesting components to the ubiquity of computers as they become a foundational technology, especially with regard to communications. As Professor Bruce Cox has noted (personal communication), the big question is not how powerful, fast, or up-to-date a person's computer is, but rather, whether one has one or not. The computer that I use for accessing the Internet (and for writing this thesis) is an IBM XT clone equipped with a 2400 baud modem. This computer is now four generations out of date,

but will nonetheless run sophisticated wordprocessing software,⁶ and, the slow speed of my modem as a communication device is not apparent to anyone on the net but myself. Because of the absolute acceleration of digital processes, even in real-time terminal chats the limiting factor is a human and mechanical one —my slow typing speed— rather than the slowness of my modem.

Thus, anyone with access to almost any computer can participate in some fashion in the so-called information society. The stage has been reached where computers are now so common that old ones are available at nominal cost. My informants tell stories about people being given old computers, monitors or components for free. There are also groups of people who collect this computer "junk", recondition and repair it, and donate the now working computers to schools so that children in the classroom may also have access. This is one way that digital technology undermines the value system of capitalist accumulation. Let us recall the classic comparison with the automobile: if cars developed like computers, a Rolls Royce would cost today less than a dollar and be able to drive across the continent on five cents worth of gasoline (Yourdon 1986:7, 11). Meanwhile, Industry and Science Canada funds the Schoolnet project whose mandate is to link all of the 17 000 schools in Canada to the Net. Therefore, the prevalence of cheap, outdated but still functioning computers becomes one way in which computers and CMC become

⁶ WordPerfect 5.1 is, on an absolute scale, a very sophisticated piece of software —a fact that is often forgotten in the mad rush of "progress" in the computer age. This forgetfulness is consciously fostered by the computer industry which has come to depend on obsolescing increasingly amazing technology in order to protect its market base. The hardware/software spiral accounts for this trend. New technology breeds new applications which *require* the increased capacity of the new machines. This then leads to more development of new technology which spirals back again— *ad infinitum*.

ubiquitous. As Freenets proliferate and grow the cost of access also approaches minimum levels. Today, nearly anyone who wishes to have some form of access may achieve it.⁷

In addition to this question of achieving access as desired through the new pervasiveness of computers, there is the question of the proliferation of computers which occurs as they become pervasive in everyday life and blend in with everyday social practices. Already it is impossible to take a book out of the Carleton University library without first using a computer to find the book; a card catalogue no longer even exists. To check the book out a bar-code-carrying library card and the book itself must both be scanned by the checkout computer. At the Carleton library it is even possible to do this without dealing with a person at all, since one fully automatic terminal is available. However, people remain social creatures and I have often watched a line-up for service at the circulation desk form, while the automatic terminal remains unused. Books may now be renewed from home via computer and modem. The system can even automatically send email about: due dates, the availability of holds, and the suspension of borrowing privileges.

Recent changes in the fee structures of banks have now made it more profitable for customers to use an Automated Teller Machine (ATM) than to use a human teller. Government terminals are now in place in shopping malls that allow you to renew your driver's license via computer. The checkout at many grocery stores is now so highly

⁷ That is not to say that simple access to the Net alone is an equalizer of social relations. As information increasingly becomes a commodity, artificial relations of scarcity will be maintained by the operation of market forces. Those with preferential access who can afford to pay will maintain access to more and "better" information and will communicate more with others of their own information class position.

automated that pilot projects exist where the customer performs the labour of the cashier. Add to this the use of computers in almost all phases of manufacturing, and the pervasiveness of these "embedded computer systems" (Yourdon 1986:2) becomes apparent.

These developments will surely soon be followed by a drastic reduction in staff, which will leave people no choice but to interact with computers. This represents another way digital technology undermines capitalism by attacking the linear assumption that more production must cost more. Thus, as feminists discovered in the access to abortion issue, the question of access has two sides: the ability to choose *to* and the ability to choose *not to* engage in a given social practice.

Additionally, this type of growing computer prevalence is accompanied by a process where the computers themselves become invisible. Joseph Weizenbaum (Dertouzos and Moses 1979:439-440) has pointed out this parallels the example of small electric motors which are so common that we no longer see them, think about them, or realize we are interacting with them. "By 1985, the average American home had forty electric motors, almost all of which are 'invisible'; similarly, the average American home already had two to three invisible embedded computers" (Yourdon 1986:10). This number is sure to grow rapidly. Computers in daily life now infest automobiles, home appliances like microwave ovens, and particularly, entertainment equipment. Telephones are switched digitally, CNC and process control etc. are involved in virtually all material production, and media content is rapidly becoming digitally mediated. As computer-

generated special effects proliferate, production, editing, sound, etc. all become based on digital technologies.

Thus, as the incorporation of digital technology produces the possibility for eliminating many people from production —particularly from simple repetitive chores—the nature of the tasks remaining for humans come to be based on successively higher levels of the information pyramid. In this way, the digital mode of communication eliminates the valorization of data and information associated with previous modes, and increasingly begins to value knowledge and wisdom.

The tragic accidental death of actor Brandon Lee during the filming of *The Crow* reveals this tendency to devalue the lower levels of the information hierarchy and the people who work at those levels. Seven scenes in the film were shot after Lee's death by digitally mapping his face onto an actor who was a body double and who acted the scenes instead of Lee (Monk 1994:E8). The aura of the cult of personality withers as a much lower-paid actor replaces Lee, while the creative agency is removed to the computer technology and its highly trained programmers.

Meanwhile, one of my informants was fooled for several days on IRC in real-time interaction by a sophisticated "Bot" — a program written specifically to simulate a human character. Although my informant points out that the level of interaction was cursory, the charade did not end with the informant discovering the true nature of the Bot on her own, but ended when the perpetrators disclosed the deception to my informant.

Consequently, for several days a Bot passed the Turing test, the classical test standard used by AI researchers to determine if a program may be considered intelligent.

In the Turing test, there is an interrogator in a room with a computer terminal which is connected to both a hidden person and the computer to be tested. The interrogator then tries to determine which of the two respondents is the human merely by asking questions through the terminal provided (Penrose 1989:6). The Turing test is framed as a test, and the interrogator is aware that they may be interacting with either a human or a machine. They are then supposed to try to determine which respondent is the machine. Accordingly, the communication context and the deception involved in the above interaction with my informant may be seen as partly responsible for its success.

However, Sherry Turkle discusses the interesting results observed by the makers of the ELIZA program, a simple, unsophisticated program that simulated the context of Freudian analysis, where the "patient's" responses are fed back to the patient as questions. Computer scientist Joseph Weizenbaum, the creator of the program, tested it on his students and colleagues. Turkle (1984:39-40) notes that

many of these very sophisticated users related to ELIZA as though it did understand, as though it were a person. With full knowledge that the program could not empathize with them, they confided in it, wanted to be alone with it....I often saw people trying to protect their relationships with ELIZA by avoiding situations that would provoke the program into making a predictable response. They didn't ask questions that they knew would "confuse" the program, that would make it "talk nonsense"....People wanted to maintain the illusion that ELIZA was able to respond to them.

It appears that Turkle's thesis is supported, that people enjoy interacting with "rule driven" computers because the risk associated with dealing with unpredictable individuated humans is absent. Similarly, with computer-mediated communications the normal risk of interacting with humans is reduced by the lack of social context. The

conclusion to be drawn from the above example is that it is acceptable, with digital communication, to interact with people at a very simple and superficial level, and that if the communication gets out of hand it need no longer be pursued. The intense interaction of individuals is deemphasized while the collective discourse is accentuated, thus, supporting the retribalization thesis. Much of my own Internet communication has had this superficial quality where a few messages on a specific topic are exchanged in a flurry, which then peters out and does not lead to any lasting exchange. Several of my informants confirmed this observation.

Almost all of my informants, including myself, have experienced firsthand the process of information overload. Upon initially gaining access to the Net and discovering the range of resources available, the common course of action is subscription to a number of lists covering a wide range of topics. These lists work like a newsgroup, but send the posted messages out to everyone on the list as an email message, so that at each login to the subscriber's account, the latest messages are there waiting in his or her mailbox to be read — or not. What then happens is that either the number of lists subscribed to grows constantly or the traffic on the lists increases, usually both. Eventually the individual is spending an hour or more a day clearing their mail box by reading some messages and deleting others unread. This decision is based on a judgement made solely by reading the subject header of the message. This state of affairs lasts either until the person gets too far behind in their mail to catch up, or experiences a busy period. Then the response is to unsubscribe to all but a few of the most relevant lists in order to eliminate the by now irritating effects of information overload. The truth of the

matter is, as Postman pointed out, most of the information gained this way is not really important to the individuals' day-to-day or work life. Several of my informants report that they have even gone through several cycles of this phenomenon of first subscribing to more and more lists, and then purging them.

One of my informants was spending so much time on maintaining email contacts with people, and was subscribed to so many lists, that on one occasion upon their return from a short trip of a few days' duration, out of email contact, they found that their incoming mailbox had filled up completely and had then frozen their account. In this case no mail can be received or sent until the overload is cleared. During the spring of 1995 the entire Carleton University email system was threatened with the same catastrophic breakdown when, collectively, the system users did not regularly clear the messages from their incoming mailboxes. This meant mail continued to pile up in the memory area allocated to incoming mail so that eventually the system as a whole was getting near to the point where it would be overloaded and no mail at all would be able to be sent or received at Carleton. The sysop had to send out a message to everyone to please clean out their mailbox — or else! Eventually, the response was that John Stewart of Carleton's Computing and Communications Services instituted a "4Mb quota on central mail folders" (posting to newsgroup: carleton.ccs.announce, June 13, 1995). Failing that, the sysop could, entirely within their rights, use their root access on the system to enter individual accounts and delete indiscriminately the mass of files that threatened the integrity of the system.

This brings us to the question of privacy. Because anyone who has root access on a computer system has absolute power over the system, privacy rights for users is a growing concern. This highlights the way that the digital mode of communication may change the balance of power between different social groups. This change does not occur in a simple way. PCs don't always equal democracy and freedom. Rather, the relationship is complex and socially mediated.

Marx maintained that any technology has impulses toward both domination and liberation. Hegemonic power, however, limits the impulse toward liberation, allowing only the articulation of the impulse toward domination. There have been other historical transformations in the cultural bases of power that have accompanied paradigm shifts in the past. One such was the change that accompanied the rise of typography where the church lost its power base to the newly emerging nation-state.⁸

With the change to postliteracy that is threatening the status of the nation-state, the locus of power is again shifting. This time it goes to those who control the esoteric knowledge needed to manipulate digital information for their own ends. This situation recreates the conditions of the Middle Ages when most people were illiterate and needed the priest-class as intermediaries and interpreters between themselves and God. Similarly, now that the computer is God, and most people are techno-peasants with limited computer literacy,⁹ there arises a new priest-class of acolyte technicians who are in the

⁸ The nation-state is here distinguished from the sovereign state.

⁹ Merely because a person knows how to use Windows, or email, or how to surf the net, or even how to program a little does not grant them status as an acolyte technician as I conceive it. The level of dedication, expertise, and esoteric knowledge needed to aspire to this status limits the number of people who may be considered to have achieved it.

process of consolidating their power base. This emergent class threatens Kroker's "virtual class" (Kroker and Weinstein 1994) who still hold enormous power but nonetheless are all too aware of the potential limitations of their being able to transfer their power base to the new digital order.

Thus, the emerging techno-priests, like their historical antecedents (O'Donnell 1994) are actively trying to position themselves to gain the maximum strategic power and simultaneously limit its spread. They use traditional ways to gain their ends. One way is to mystify knowledge; make it difficult, jargon laden, and keep it constantly changing so that only the dedicated can keep up. Another way is to naturalize origins (Barthes 1973 [1957]) to make it seem that the current state of affairs is the only one possible, natural and, thus, unquestionable. This is how the great myth of the benevolent, anarchist sysop operates. Because systems operators have absolute power over their systems, and thereby their users, they are vulnerable to critiques based on the potential for the abuse of power. As the shift to a digital mode of communication proceeds and makes this power increasingly important, the sysop/priests as a group tend to form something of a cabal (Rheingold 1993:120). In the early days, almost all sysops were 'hackers' who often dropped out of school programs either because they knew more about computers than their professors, or because they wanted to devote all of their time to their systems (Brand 1987:57). These early hackers were often filled with ideas about the liberatory potential of computers, and maintained the anti-establishment mood of the nineteen-sixties within them. This led to the romanticization of the "hacker".

Today the situation is entirely different. Because of the technical advances in software engineering the computer science professor usually knows more about computers than his/her students. The hacker has become a marginalized figure, unlikely to be incorporated into the power structure of large systems that have themselves grown specialized, bureaucratic, professionalised and which are run by people who are more concerned with security than liberation. There is general agreement among my university-based informants that such is the case at Carleton University. In this situation the reification of the image of the sysop as anarco-libertarian works to limit criticism of this new powerful group while facilitating their consolidation of power without opposition or the institution of social controls on their power.

Stewart Brand (1987:205) maintains that when judging the value and accuracy of communicated information you cannot trust the medium or the message, only the source. This is especially true for digital communications where, because of the possibility of invisible manipulation, there is no stable text. As an example, consider that most of my essays exist as files on my hard drive. Because of two factors there are usually many different files associated with any single essay I have written. One, the ease with which digital copies may be made — sometimes even inadvertently — with only the press of a few keys. Two, the unreliability and lack of robustness of digital media compared to other media: the disastrous nature of most drive failures; the very high capacity of even 'floppies' when merely storing text files; and for anyone trained in computers more than ten years, ago the residual ingrained habit of making multiple back ups. All these factors encourage the proliferation of multiple copies of files. With these old essays it becomes

difficult, if not impossible, for me to tell which file contains the "real" essay. There are so many versions of it, all differing to a greater or lesser degree, along with the supporting information: quotes; notes; downloaded information; outlines; references; etc.¹⁰ This means that one of the literate foundations for evaluating information has been destroyed by the conversion to a digital format — the expectation that the information will remain stable so that extended in-depth analysis can be performed on it. If I wish to reevaluate one of my old essays I may not even be able to locate the version that was handed in (Remember, there is no true original).

This difficulty is not eliminated by the use of date and time markers in the directory of files. First, as is the case on my system at least, the system clock may not be accurate. If one carries disks from one system to another, from home to office or library etc. and manipulates these files in more than one location then the date stamps become useless. Second, the "final" version of an essay, for example, may not simply be the last in simple temporal sequence. This is another instance of how the mutability of digital information undermines the stable text.

Thus, because of the ephemeral nature of digital information; the lack of paralinguals which include "the way speech is stressed, pitched, accented, as well as all the information carried in stutters, pauses, gulps, tones of voice" (Brand 1987:55) or meta-communication which additionally incorporates visual, gestural and proxemic dimensions that reveal identity; the sheer volume of data providers; the difficulty of judging the credentials of posters, it becomes exceedingly difficult to evaluate the sources

¹⁰ Remember also that the descriptor for all of these variations must be, at most, eight to eleven characters long with a three character extension. Obviously these descriptors are, at best, cryptic.

of digital information. This hastens the change to an oral mode of determining truth where truth is determined by a dialogical group process of consensus. In the digital mode of communication, as in oral cultures, the authority ascribed to the truth of a piece of information stems not from the authority of individual sources but from the level of the discourse as a whole. If multiple sources provide the same information or if one source of information is not attacked vociferously by the multitude then the authority of the information in question increases. Thus the tradition of "witnessing" in oral cultures is explained (Brumble 1988:29-30). This process does not simply reproduce the same truth as the literate mode of communication, something that should come as no surprise to most anthropologists. The two conceptions of truth diverge when "common sense" knowledge is involved. Is the literate version of the truth inherently better? The answer is beyond the scope of this paper; nevertheless, by way of demonstration I refer the reader back to my example of the JFK assassination. This illustrates how the different conceptions of truth may operate at differing levels of logical typing which are valid only at their appropriate level (Bateson 1979).

As in survey research where the question itself may produce an opinion where none existed before, the ability of everyone on the Net to express their opinion causes everyone to have one — on every subject imaginable — regardless of the actual level of knowledge involved. It is also possible that the argumentative culture of newsgroups may exacerbate this trend. For example, in the sci.anthropology newsgroup there is an ongoing/recurring debate about the Aquatic Ape Theory (AAT). This debate is characterized by a profound level of ignorance of the details of the AAT hypotheses and

debate. Posters repeatedly and nonchalantly begin posts with such phrases as: 'I'm not sure but I think'; 'I believe that'; 'didn't she say?'

In another instance, while surfing the Net one night,¹¹ I came upon a series of posts in a vegetarian newsgroup about what foods a vegetarian could eat in a Greek restaurant. One poster referred to hummus as a good 'Veggie-safe' food to eat in Greek restaurants. While hummus is certainly Veggie-safe it is not traditional Greek food. At the time of reading this thread I was merely amused but I later realized that I ought to save these posts as an example of how newsgroups are full of opinion rather than information. When I went back two days later looking to download that particular thread for my research I followed the same communicative procedure only to find the message I was looking for was gone. It was missing without a trace other than the one left in my consciousness and memory.

Since the original poster of a message retains the ability to erase their post, it seems likely that the person in question was informed of their error by a multitude of responses and removed their post in embarrassment. However, my experience of its removal was as if it had never been. I followed the same embodied ritual of keystrokes only to discover what I sought was gone. This experience even had me doubting myself and whether I had seen what I thought I had. This, then, is an example of the ephemeral nature of digital information. The Net may be full of data but if you personally do not download it right away it may not be there later when you go looking for it. Rheingold speaks of the earliest days of experimenting with computer-mediated communications and

¹¹ The term and reality of "surfing the Net" captures the feeling of scanning for pattern recognition characteristic of the digital mode of information.

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PM-1 3½"x4" PHOTOGRAPHIC MICROCOPY TARGET
NBS 1010a ANSI/ISO #2 EQUIVALENT

PRECISIONSM RESOLUTION TARGETS

the process of sharing introductions with an online friend: "I saved his 1983 self introduction to the online world because I had a hunch this electronic vanity publishing business might be important some day" (1993:242). Even the addresses for entire Web sites have changed and servers have stopped offering a service such as when my usual Gopher access to the journal database UNCOVER was removed forcing me to find a new entry point and relearn bodily the ritual process for accessing it. The similarity to oral forms of discourse is attested to by Rheingold (1993:104) who finds that: "All the arcana and uncertainty make Netsurfing somewhat alchemical. Things change so fast that folklore is the only reliable way to find out what is really new".

Another case provides an illuminating example of both the process of change in who holds power in the digital mode of communication and the difficulty of evaluating online sources of information. One evening when I was logged into my Unix account I received my first "talk" request from another user. Talk is a Unix feature that allows two users to communicate in real-time on a split screen. I did not recognize this other person's user-I.D. which is the only information provided by the system at the time the request is made. This name usually consists of a first initial or two and as many characters of the last name as will fit in a wordlength of eight characters. For example, my user-I.D. is rmacleod.

Because the Unix system is limited to members of the university population its users may think of themselves as a community. As the size of this community continues to grow informal sanctions are gradually replaced with formal ones and the sense of group identity is diminished as I found out. When I accepted the "talk" request of the

other user we had an online realtime conversation of perhaps five minutes. I was told that they were new to the system and just wanted to see how this function worked. In a friendly spirit I welcomed them and asked about who they were. I was told that they were a female graduate student and a few other details. I told them a bit about myself and we broke the connection after they said they had to go. This communication took place at approximately 9:30pm on a Saturday evening.

About five minutes after this first exchange took place I received another request to "talk" from another person I did not know. To have two such requests in such short order was highly unusual because the rules of "netiquette" discourage people from bothering others online with intrusions such as this. Intrigued to see if the two requests would be related I accepted this request also. The person began by politely apologising for bothering me (netiquette protocol) then asked if I had received another request just before this one. When I affirmed that I had, this person told me that they had sent a stern warning via email to the person who had contacted me telling them not to play with the talk function or they might lose their account privileges.

This second person told me that they thought my first caller had been a male¹² who was a "newbie" to the net who was randomly requesting to talk to other users in the hopes of finding a female user who they could then harass by trying to institute a "hotchat", consisting of sexual innuendo, which is of course a severe infraction of netiquette — and a taboo which is constantly violated. In response to my asking

¹² The single most prevalent use of the lack of meta-communication on the Internet is gender morphing. By far, the most common morph is males pretending to be female in their interactions on the Net.

suspiciously how they knew that this person had requested to talk specifically to me they told me that they had worked for the computer services branch of the university and that they had seen this before. There are public functions available to anyone with a Unix account that will display the user-I.D., location, login time, and a few other bits of information about all of the users currently logged in.¹³ By looking at this list, people who are in "talk" mode can be identified. I asked a few more questions about the nettiquette of the talk function and then terminated this connection also.

At the time, all of this had seemed vaguely exciting and it was an interesting experience to meet, so to speak, some new people online — however briefly. Nevertheless, as I reflected on the experience later that night I began to grow increasingly uneasy. The central issue was trust. I simply did not know who or what information I could trust. I had no idea who these people were and no way of independently verifying, through outside channels, any of the information they provided me.

The first person said they were female yet the second thought they were male. Presumably the second person did not have any more information about the first person than I did. In fact I eventually discovered that the person who initiated the first talk was indeed female. Nonetheless, the second person knew things about my communications that I was normally used to thinking of as private. The feeling of having experienced Big Brother firsthand was unmistakable and was increased by the way person no.2 appeared

¹³ Unix is an operating system designed for large institutional computers in order to facilitate research and communication between researchers all of whom could be assumed to share a common interest. It has been updated and modified tremendously since its introduction to adapt it to new contexts because of the daunting nature of designing a new operating system from scratch.

uninvited on my computer screen. They told me that they *had* worked for the computer services department but that implies that they were not acting in that capacity at the time -- late Saturday evening.

Therefore, the question remains: by what right did they, politely or not, feel that it was their place to police my private online communications with another person? I did not ask for help with a bothersome person and there are software tools expressly for this purpose. The person's login is known and thus a complaint can be launched by the person who is bothered and, further, it could be lodged with those whose responsibility it *is* to enforce whatever rules exist for online communication.

This raised the issue of third party intervention which is rapidly becoming an important issue on the Internet. There is a disturbing trend in cyberspace towards paternalistic regulation of what is vociferously touted as a "democratic" medium. IRC is now illegal, MUD's are illegal, games are illegal. Communicative acts between two consenting people online are being declared illegal and forbidden by people whose authority originates purely from their position as technical personnel. The ability of anyone with a good knowledge of Unix to 'police' the net is a disturbing possibility not a reassuring one. Nevertheless, it supports the assertion that the change to a digital mode of communication is accompanied by a change in the cultural locus of power. Further, this change moves toward a decentralized group model of social control such as is found in oral cultures. For instance the practice of mailbombing obnoxious posters on the Net is akin to the public shouting down an irritating speaker in a crowd.

This shift in the locus of power raises the issue of what is a legitimate use of computer-mediated communications and who determines it? To date, the history of the Net has largely been a process of individuals appropriating or building tools for themselves to communicate in a fashion of their choosing which with growing popularity is repressed and prohibited or charged for by those in traditional positions of power.

On the other hand, the ongoing struggle between the administrators and users of Carleton University's CHAT system of undergraduate computer accounts highlights the way computer-mediated communications challenge hierarchical, "literate" communication and favour the more tribal styles. The Carleton Hotline for Administration and Teaching (CHAT) accounts were conceived by the university as a way to facilitate communication with undergraduates whose burgeoning numbers made it difficult to reach through normal channels. During its first year of operation the CHAT system far surpassed its expected utilization rate when around 7000 students signed up for accounts instead of the expected 3500.

This unexpected popularity led to a case of what I like to call 'the disaster of success'¹⁴ which occurs with increasing frequency as information goes digital. In the case of CHAT the load on the system from far too many users who stayed on the system

¹⁴ The disaster of success occurs when something is unexpectedly an order of magnitude more successful than was originally anticipated and planned for. This degree of success then becomes a problem when the system is pushed beyond its designed limits and service either suffers or is cut off. No system can absorb unlimited growth without negative effects manifesting. This phenomenon may represent the early signs of systemic failure since the loss of equilibrium has as its first effect radical oscillations whose endpoints are outside the normal bounds of the system. For example, the first sign of global warming would be found by charting not average temperatures but the number of records broken per year for *both* highs and lows of factors such as temperature and precipitation. The burgeoning growth of the Internet, Freenets, and other digital networks is a primary example of the disaster of success, riots at sold out rock concerts is another.

for far too long made access to the system extremely difficult and at times impossible. My informants confirmed that the students had appropriated the CHAT system for their own communication uses such as IRC, MUDing, emailing each other and posting to newsgroups incessantly. All of these were considered by the administrators to be somehow illegitimate since the system was intended to facilitate academic work. The response was to limit login times and to ban many of the activities that were known to keep people online for extended periods. This scenario has played itself out again and again right from the unexpected success of the very first network, where the biggest use was for email, most of it discussions of science fiction (Rheingold 1993:76-77).

Thus, the larger issue to emerge from this discussion is: if the computer becomes primarily a communications device, who and what will determine the nature of the communications that make up the content of computer-mediated communications? Early indications support my contention that the nature of digital communication tends toward an oral model where communication is less hierarchical, more democratic, but filled with gossip, hearsay, and 'illegitimate' or 'low' communications.

This question of peoples uses for communication as opposed to official uses for communication raises the very interesting point that illegitimate uses of media may be central to their initial success and acceptance in the first place (Brand 1987:27-28). It is important not to underestimate the role of taboo, illicit, illegal, or counter-cultural uses of new media in the original rapid expansion of the medium in the first place. For example, the phenomenal growth of the early VCR home market —forty percent by 1987 (Brand 1987:29)— was debatably due to the availability of pornographic videos that were

simply unavailable in other media formats (Brand 1987:28; Lent 1991:94). When the motivation to adopt a new technology arises from one of these taboo motivations the users are willing to bear the high costs of being among the first to purchase a new technology.

In the case of CMC it was less a matter of economic costs than it was of the social costs of acquiring the skills necessary to access the new media. However, the costs and technical difficulties of accumulating a computer, modem, and software to run the system was certainly not negligible in the early days of computer communications. For anyone who thinks computer pornography had to wait for transmittable digitized images such as .GIF files I can report that I have seen a text-only computer adventure game for the Apple II that was sited in a red light district. The goal of the game was to successfully find sex.

I agree with Brand (1987:28) that studies of the early role of pornography in computer communications are lacking, but that it was important in the spread of new media such as VCRs (Rheingold 1993:143-144, 183, 221; Rheingold 1991:345-352; Brand 1987:209). The crux of all of this may be that the question is fundamentally linked to the relative existence of separate public and private spheres. Our usual conception of public and private is cultural and historical. Innumerable anthropological stories exist about ethnographers doing fieldwork among tribal peoples who became irritated over the lack of privacy and the level of gossip among the people studied who knew about and discussed in great detail matters that the anthropologist found ought to be private (Chagnon 1992:5-31; Kottak 1994:4; Evans Pritchard 1940:14-15). My position is that

the extreme separation of public and private is associated with the literate mode of communication and that the change to a digital mode of communication will tend to decrease the level of separation between these two spheres. Certainly the preceding discussion and the amount of concern in general about issues of privacy on the Net tend to support my conclusion that digital speech must be treated as an inherently more public form of speech. If for no other reason than assurances of privacy by business and government are difficult to place any faith in regardless of the presence or not of a "clipper" chip.

One thing that my informants and I have all commented on is the changes that take place in writing conventions as text becomes the digital text of computer-mediated communications. Several changes have occurred, most of which are not limited only to synchronous realtime communications such as IRC, MUDs, and MOOs.

One, the automatic reply function for email and newsgroups includes the complete text of the message you are responding to at the press of a key. The "Netiquette" convention is that you include the pertinent bits of the previous message which you are speaking to and edit out the rest using the term "snip" or "stuff deleted". However, it requires many more keystrokes to edit the text than to include it and many people do not bother to edit the previous message. Each time a previous message is included in a new one the system automatically includes a header saying "John Doe writes:" and a string of ">" characters along the left margin to identify the included text. When several messages begin to bounce back and forth the text begins to include multiple layers of ">" markers where the more ">" characters there are the older the message is and as

you read down the number decreases until the completely new message appears with none. It is quite common to see an extremely long message with several screens of 'historical' quoting, plus a two sentence reply at the bottom.

This phenomenon has the effect of increasing the redundancy of the message which is required because not all sites receive all of the previous messages at the same rate so without quoting a reader may be confused if a message refers back to a message that has not yet reached their site. When the editing convention is not followed and the messages get too unwieldy and the new message content becomes very small complaints are made that say the signal-to-noise ratio is getting too low. This is an erroneous assumption since by definition noise is both unwanted and carries no communication content. Static on a phone line is noise, hearing a faint echo of someone else's conversation is crosstalk, not noise. Because the information in this case is a repetition of the original signal, it is increasing redundancy not adding noise. The level of redundancy sometimes becomes uncomfortably high, but that does not mean that the "signal-to-noise ratio" has changed. What this does mean is that the digital text has become more oral in nature. Repetition is a standard feature of oral discourse: by its nature it requires more redundancy than written text. Furthermore, it takes real effort to produce oral knowledge (Ong 1982:32-33). Much of the trouble here is caused by the proclivity for reducing as much as possible the effort required to communicate which is also a standard feature of oral discourse. Finally, this convention affects the form of the communication by making it more like an oral dialogue where stimulus and response are much more intimately and closely linked than is the case with written communication.

Two, there is within the style of writing (typing) a general reduction in literate conventions. No-one bothers to spellcheck; no-one fixes typos —even egregious ones— they are either left in as one types on, or, if the mis-start is too gross, the person simply adds a space and restarts the word; there is little or no concern for grammar as long as the meaning is clear. All of these attributes of the change to digital text have the effect of making it more like oral speech. For example, within Saussure's *langue* and *parole* (Fiske 1990:123) and Chomsky's (1957) transformational-generative grammar is the idea that no expression of speech can be considered ungrammatical; all reveal some aspect of deep structure.

Three, there is an attempt to include some of the paralingual elements of face-to-face oral dialogue. There is a convention that typing in all caps means the person is SHOUTING! The bracketing of a word with asterisks means the person is adding *emphasis*. Anything enclosed by angled brackets < > is taken as subtext or as denoting a physical action. <g> means the person grins. <ROTFL> means Rolls On The Floor Laughing. Many <hug>'s are exchanged in cyberspace, and in MUDS and MOOs, where this convention began, a vast amount of para-lingual information is exchanged which has often become highly ritualized just as in face-to-face oral interaction. Another way of introducing paralinguals is the common use of "emoticons" such as the smiley face. :) There is now a vast number of cleverly devised smileys but one of the most common is the winking smiley ;) used to denote irony. This in particular mirrors oral speech where it is sometimes difficult to denote ironic intent by inflection. That these emoticons are culturally specific is shown by Rheingold (1994:195) who notes

that in Japan the smiley is not read sideways but instead "looks more like an abstract facial representation: (^_^)."

Four, the common use of acronyms is another example of the tendency of oral speech toward minimizing effort. IMHO means In My Humble Opinion. BTW means By The Way and RTFM means Read the Manual to name three of the most common. Five, the synchronous media such as IRC, MOO, and MUD are all multi-channel media. Thus, the communication is polyvocal and several threads of conversation often overlap simultaneously on the same channel. This oral characteristic is completely absent from other forms of written text.

Flame wars are normatively discouraged even while they are being propagated profusely. This leads to the ironic situation where there will be a flame war thread started by someone calling for others not to 'waste bandwidth' with their drivel. Presumably this person's 'drivel' is important enough to warrant the use of bandwidth and hypocrisy is not an issue. What is an issue is that these forms/uses of the communication medium of CMC are ubiquitous and therefore may be presumed to be fulfilling some communicative function. Perhaps it is a response to the lack of paralingual dimensions of communication or the lack of other ways of building, maintaining, and delineating community on the net. At minimum it shows that the impossibility of truly having a "heated exchange" in written text has been replaced by the tendency of oral discourse to lead to exactly such a result in cases of disagreement.

Another example of the way the digital mode of communication fosters the tribal valorization of wisdom stems from the way digital information processes are opaque.

With the CD-ROM journal database Sociofile for example, you cannot see what goes on behind the screen; the search procedures are hidden from the user. Information may be there or missing and the user cannot tell. One of my informants told me that if you search Sociofile on the name bell hooks it only supplies four hits. Obviously the data base is not as comprehensive as it purports to be. On the other hand, consider the response if large sections of a library's holdings went missing such as when the University of Ottawa had all of its Women's Studies current periodicals removed, the loss would be immediately noticed.

Further, the process of generating information tends to become mystified as users lose touch with lowest level of data and have no personal experience with the tools that generate higher levels of abstraction. I was told that statistics students today performed actions mechanically and with less understanding of the underlying principles even though the analyses themselves had become far more complex. Hence, it takes long-term familiarity with the vagaries of the digital mode of communication to generate in-depth understanding. This wisdom, which will no longer be common, then comes to be valued.

Many of my informants reported that when they were out of email contact for even a few days they had a disconcerting feeling of being "out of touch". They also reported feeling like: "I needed to check my mail". This mirrors the sense of discomfiture of the member of a tribal culture who is cut off from the comforting communications with the group.

CMC for the masses complete the globalization picture. Faxes, Cell phones, and cheap¹⁵ long distance rates —not to mention the use of the Internet itself— are all results of digital media. These technologies have been implicated in events of global significance such as the Chinese pro-democracy movement and the events in Tian-an-men Square; the Oka crisis in Canada; the monitoring of the Chinese in Tibet.

There are no "experts" on the Net. Even for the technical priest class, there is always some piece of information that you do not have that waits to trip you up. Examples of the limit to expertise are the arrest of hacker supreme Kevin Mitnick, who was finally caught by the police's own computer expert, and the story about a professor at Carleton University, told to me by my informants, who had a so-called expert from computer services reformat his computer's hard drive in an effort to eliminate a computer virus that had infected it instead of using the newly available "Kill monkey" anti-virus program. The personal possession of knowledge comes to be valued less than knowing where to find information. The power of the tribal cooperative groupmind at problem-solving begins to be greater than that of the literate reified individual (Rheingold 1993:110-144). A simple call to the Net for information such as for a forgotten reference will usually within hours generate several responses. Rheingold (1993:17-37) has reported on the collective problem-solving response of members of the WELL who pull together to rapidly deal with crises. This parallels the perhaps mythical story circulating among anthropologists about the ethnographer in the field who had trouble with his

¹⁵ It is projected that soon long distance communication will be free in the sense that general metered access to digital communications will come to all communications as convergence proceeds. This will mean that the relevance of distance is eliminated. There is already a company in the 416/905 area that offers unlimited long distance calling within these area codes for less than \$100 a month.

experiment when his subjects continually got up to consult with their kin. When he explained that he wanted them to each do the experiment in turn by themselves they responded that was not the way they did things in that tribe. That tribe worked together collectively to solve problems.

My research confirms Rheingold's report (1993:167) that there is a conventional process that follows in online romances that goes through stages of: meeting online; communicating everyday by email; letter writing; the exchange of photographs; long distance phone calls; eventual meeting face-to-face, often involving travelling long distances. This process which one of my informants has been through shows that the original computer-mediated communications is sufficiently intimate to allow the possibility of a romance to develop which requires the expenditure of large amounts of money before the people involved ever meet in person.

Thus, as can be seen from the preceding evidence, the digital mode of communication has cultural effects that move society back toward the norms of primary orality. Because this is the case, communications must also begin to incorporate the nature of human oral communication into its theories. In order to facilitate this project, a critique of classic communication theory is undertaken in the next chapter.

Chapter Five: A Critique of Communication Theory

Having now shown how the digital mode of communication operates, it is necessary to complete the analysis with a critique of communication theory. Once this critique is accomplished it should be possible to begin to move beyond the limitations of our worldview as constituted by the literate mode of communication to a more holistic perspective of the nature and history of human communications.

Robert Lucky discusses at length Claude Shannon's 1948 paper *A Mathematical Theory of Communication* which set forth the fundamental principles of information theory that remain axiomatic to this day. Engineers working in the field today understand the "essence of information as the irreducible, fundamental underlying uncertainty that is removed by its receipt. In the Shannon sense information is measured through uncertainty. Information is viewed as being the *resolution of uncertainty*" (Lucky 1989:40). Shannon showed that the number of bits of information in any data is determined by the "*minimum number of yes/no questions required on the average to arrive at the given data*" (Lucky 1989:41). It is important to keep in mind the necessity for using the *average* minimum in this relation. The advantage of the odd lucky guess, if one adopts such a strategy, is more than offset in the majority of cases by the loss of efficiency caused by the waste of an entire question.

Shannon was able to prove mathematically that "information is simply measured by the logarithm of the probability" (Lucky 1989:43). There are two factors, however, which make the application of Shannon's simple equation exceedingly difficult. In all but

the simplest of real cases it is very difficult to "enumerate all possible situations, evaluate the probability of each...and average the information measure of all of these possibilities" (1989:43). If this task is successfully completed, then Shannon's equation will measure the lower limit of the average number of bits required to code the data in question. Lucky (1989:44) emphasizes that this result means there is an "inescapable lower bound on the number of bits required to reconstruct dataThere is no way to do better, regardless of how hard we try or how clever we think we are". This leads to the other problem with applying Shannon's model, that it is not possible to predict the actual formal method that will "*achieve this minimum representation*" (44). There is always a limit to how cleverly information can be coded and, in fact, the relation holds where "the closer we try to get to the limit, the harder it becomes" (45). The use of the Shannon model lies in its ability to indicate when a given method of coding has achieved an adequate theoretical limit, at which point it is no longer worth pursuing better codes.

The only advances being made in data compression today stem from fine-tuning the algorithms around the point of diminishing returns. This leads to small incremental progress, but it is known in advance that there will not be any further leaps in efficiency. Most of the progress that has been made recently in digital communications has come from increases in the availability of bandwidth made possible by technical advances like the development of fiber optics. As bandwidth becomes increasingly less expensive, the incentive to continue tweaking compression ratios disappears. Nonetheless, there are limits to how much bandwidth is potentially available. This may not seem to be much of a problem now, but given the tendency of digitally-transmitted communication to grow

exponentially, it is likely that increasing bandwidths has only bought a little time before these limits again become problematic.

This analysis relates to the previous discussion of the general cycle of technological development, as illustrated by the discussion of the heat engine. In digital communications, one grand cycle is coming to a close as the refinement in the technology is beginning to approach the theoretical limits of its development. According to this developmental model, a completely new technology is needed next, one which is based upon different principles and which, in its most primitive form, surpasses the performance levels of the most advanced stages of the previous technology. The trick here is to recognize and predict the area of the coming breakthrough. This project falls into the area of short-term prediction. It is far less risky than long-term prediction and suits an age of increasing research costs and decreasing research budgets. If McLuhan is right and even our own technology is ahead of its time, then even a slight degree of predictive success has the potential to save large sums of money and quite a lot of time in our basic research efforts. I believe that it is a useful technique to look at the oversights of the previous paradigm for insights into the potentially rewarding directions for further research.

Robert W. Lucky (1989:38-39) quotes Shannon himself, who reveals one such limitation:

The fundamental problem of communication is that of reproducing at one point either exactly or approximately a message selected at another point. Frequently the messages have *meaning*; that is they refer to or are correlated according to some system with certain physical or conceptual entities. These semantic aspects of communication are irrelevant to the engineering problem.

As the Executive Director of Research for Bell Laboratories, Lucky is as current on the information revolution as it is possible to be. His only response to the above quote, before continuing in the rest of his book to focus on Information, is to say:

In some respects I would agree that the disregarding of what Shannon called "meaning" is a philosophical deficiency of information theory. Yet I would despair of producing useful concepts in a theory that accounted for a property that is as difficult to measure as meaning, or, what is a consequence, value. (Lucky 1989:39)

Here we have it, a limitation of the entire field of information theory — the *a priori* assumption that the "meaning" of information is "irrelevant to the engineering problem".

Shannon's theories are further limited by his disregard for the quality of the "reproduction" of the message. He is correct in stating that the essence of communication is to reproduce a message that originates from one place in another place. While he was thorough enough to say the message could be reproduced "*either exactly or approximately*" in the other location, he neglected to define "approximately", the one term I consider crucial to the problem of advancing communication theory beyond the limits of the Shannon Mathematical model which underlies most of the field of communications.

The traditional interpretation of this word "approximately" has been a thoroughly technical one. It has been understood as a question of "signal" and "noise", as in the term signal-to-noise-ratio. The signal is simply the useful information-carrying component of any communication, while noise is any unwanted non-information carrying intrusion into the communication. As long as the signal-to-noise ratio is high enough that the information content of the message gets through, then everyone is satisfied. The signal

may be "approximately" reproduced to the degree that the intrinsic redundancy of the information allows the receiver to reconstruct the signal, regardless of the noise. It has been said that Russian speech could be understood on a telephone line with very bad static far better than English would be. Many who are fluent in both languages consider English to be less redundant than Russian and more terse sounding. With the much longer words of Russian, greater portions of them could be rendered unintelligible by static before the information would fail to get through. As long as the received approximation of the signal is similar enough to the original that the message can be recreated and understood, there is little problem in communication. That is the only way that approximation has been interpreted in communications to the present moment.

However, approximation's participation by analogy in communication should no longer be overlooked. Analogy becomes a factor in communication when considering, as Nicholas Negroponte and Marvin Minsky of the MIT Media Lab have, how to move beyond the limits of the mathematical model of communication. Both are

impatient with the limitations of the 'electrical engineering' approach and are pushing for serious pioneering of a new kind of data compression which takes account of the *content and meaning* of the material being compressed.

In the politics of communication technologies, this is radical, Left Wing, dangerous thinking. (Brand 1987:79)

These politics, together with the reluctance of top engineers such as Lucky to attempt such a thing, may explain why Negroponte and Minsky earned a reputation for tackling the "interesting" and "hard" questions (Brand 1987:101, 106). Minsky suggests his own addendum to information theory: "Maybe we should make a *tri*-stinction — signal, noise, and meaning" (Brand 1987:107).

Stewart Brand reports on his discussion with Negroponte about this approach, which he calls "semantic data compression". Both Negroponte and Minsky agree this is the only possible way to further increase data compression by an order of magnitude, providing information theory "solved all of the problems and new ones didn't come up" (Brand 1987:78). Because all of the projects at the Media Lab have practical justifications, Negroponte discusses semantic data compression in the context of the attempt to put an entire feature length movie on a single CD-ROM — the "paperback movie" project. Since today's techniques accommodate only eight minutes of video on a CD-ROM, this is an ambitious project:

You have to get very deeply involved in the world of artificial intelligence and have the machine know something about the movie. The system would need to look at it several times, understand what's going on, what's in the background, what's in the foreground...Who's doing what — and use a semantic data-compression technique" (Brand 1987:80).

Further on he tells Brand (1987:81):

"You ask me, 'What's it like in Patmos?' And I tell you, '*It's like the last scene in the movie 'Kaos.'*'" My mind filled with that extraordinary sequence — the children leaping/flying down a steep white sand dune into water so blue it might as well be sky. He went on, "That's maybe ten words, forty characters, just a few hundred bits. Clearly it's not a complete description. It only works if I know you've seen 'Kaos.' So a system that compresses that way has to know not only about the signal but about you. It's taking the hundreds of millions of bits needed for transmitting scenes of Patmos and reducing them to a few hundred." "Analogy," I said, keeping my bits to the minimum.

He agreed. "Analogy is a wonderful way to think of semantic data compression: this signal is like that signal, and you got that signal already. It is a dramatic class of bandwidth compression that will start to emerge in computer science."

An attempt to think about the realities of semantic data compression as a communication strategy is important. Negroponte himself uses an analogy that is so far totally impossible for computer-mediated communications. Information theory opposes the uncertainty about the value of a given bit —the entropy— to the degree of order and structure or redundancy of the aggregate of bits that makes up a communication. The more entropy there is in a signal, the more information that signal conveys and the less it may be compressed by clever coding. The more structure and redundancy there is in a signal, the less information it conveys, but it gains in its resistance to degradation by interference or noise. Thus, the Shannon-Weaver mathematical model of information leads to the bizarre conclusion that a completely random signal would carry the most information. That is what happens when we ignore the importance of meaning in communication. What has been ignored in even the idea of semantic data compression, however, is the nature of the relationship between program and transmission. This replays the form/content dichotomy which, under the reign of the literate mode of information, privileges the content aspect of the dichotomy exclusively. The focus in communications theory has previously been on the transmission of information, rather than on the "program" that codes and decodes the information at either end. Now it finally becomes apparent that the communicative act cannot be fully understood without considering the relation of transmission and program. This also involves the question of precision in communications, which up to now has only been considered as redundancy, and therefore as something to be eliminated by successively clever coding schemes, or

as error, which must be completely eliminated. The idea of successive approximations has been absent so far from communications theory.

When information is handled by either a computer or a human it goes through the processes of input, storage, processing and output. During all of these stages the information must be somehow coded. The program that codes and decodes the information is specific to a particular medium and affects the operations that may be performed upon the information content. In human cognition, different styles of processing are possible for information coded in an oral form, as opposed to that coded in print. The total informational context of the individual's entire life experience is incorporated into the "program" that handles all information received, regardless of how it was transmitted. It is this truly enormous data base that enables humans to use semantic data compression. This relation may be seen in embryonic form in the development of computer-mediated communications. Over time, as the codes became more and more efficient, the amount of data that had to be transmitted was increasingly reduced. Each bit carried more and more information with it as more and more redundancy was eliminated.

Simultaneously, however, the amount of information that needs to be stored in the sending and receiving computer increases steadily as the program for coding and decoding grows. The program provides the "key" for decoding the transmitted information into its original form. This "key" may be relatively small, but it tends to grow nonetheless. Successive generations of PCs, for example, have needed to increase their on-board RAM from the earlier standard of less than 64K bytes, through increments

of 640K and 1-2-4 Meg. to the point today where a minimum of eight Megabytes of RAM are needed and sixteen Meg are recommended. A video card may now have an on-board 1Meg memory — more than the entire RAM of a PC XT! All of this is in the service of facilitating the handling of invariably mathematically precise information. When humans communicate, on the other hand, the degree of precision in communication is a variable that changes according to judgement about the context. Human communication is very rarely really precise. Increases in precision require increased bandwidth; in human communications legal texts, with their large size and complexity, come to mind as relatively precise communications.

Most human communication is aided by the use of imprecise but powerful strategies such as metaphor, simile, oxymoron, etc. Computers do not know about similes. Bateson discusses this kind of "pointing" information as "ostensive communication" (1979:83). Since teaching certain concepts such as handedness requires ostensive communication and physicists have shown that handedness seems to be a fundamental property of the universe it is plausible that machine communication will eventually have to incorporate some form of learning that is ostensive.

Thus, to transmit the idea of "John Doe" might require only the transmission of the word "John" to have more or less complete understanding between two people who have stored in them already a comprehensive model of "John". However, depending on the communications context, the information required to transmit Johnness may grow to enormous complexity. To recognize John, a stranger, based on information previously transmitted, would require a detailed physical description which includes many more bits

than are needed to say *John*. Then imagine for a moment the transmission requirements of *Star Trek's* famous "transporter", surely the ultimate communications device. This machine is capable of transmitting the *entire* informational complexity of the whole being that is John. Transmitting only the genetic or some other code is not enough since the entire contents of the person's life experiences stored in the mind and body must also be transmitted, or else the "person" on the other end will not really be John. This task requires a staggering amount of information to be transmitted.

Compare Negroponte's "paperback movie" with Clifford Geertz's (1973) Balinese cockfight. In Geertz's account, the authorities finally arrive to break up the event; cockfights are illegal. Geertz, whose conception of "thick description" is itself a form of semantic data compression, uses a simile to describe the arrival of the police when he tells us "the policeman jumped out, and, springing into the center of the ring, began to swing their guns around like gangsters in a motion picture" (1973:414). This bit of description conjures up an incredibly vivid image for me, as I expect it does for most of his readers, because of the pervasiveness of such imagery in Western culture.

Furthermore, even my choice of an example from Geertz's Balinese cock fight is itself based on my assumption that most readers of this anthropological work will be familiar with the Geertz article; it is one of the most widely read articles in the anthropological literature. This knowledge provides even more context to my communication since the Geertz article is much larger than the small part I highlight in my example. This collapsing of information into increasingly dense domains far exceeds the concept of chains of signification, but it shows where the Shannon-Weaver model of

communication falls down. Thus, Geertz's conception of "saying something of something" (1973:448) may itself be interpreted as saying something different about something that makes a difference, and therefore conforms to Bateson's definition of information. Here, the process of coding the significant difference relies on the semantic coding of information in order to produce meaning.

What is most interesting about all of this is that anthropologists familiar with oral cultures are already familiar with folk procedures for facilitating semantic data compression. They are of course the techniques that oral peoples use to keep large amounts of precise information about their culture stored in their memory without the aid of written records. Techniques such as allusion, mirroring, alliteration, poetic methods, and especially ritual and myth work to collapse increasing amounts of information into coded forms. These forms may later be unpacked or decoded by the application of the stored codes of the individual's cultural knowledge accumulated in memory.

For anyone who doubts the importance of this relation, I point to the remaining vestiges of our preliterate heritage. Simple mention of persistent traditions of "intuition", "magic", "spiritual knowledge" etc. displays the utility of this type of knowing, which is devalued by the literate mode of communication but which cannot be denied to "make sense" or retain its utility. Take for example, two bits of oral wisdom juxtaposed so that they resonate with multiple meanings:

Look Before You Leap and He Who Hesitates Is Lost.

The information potential stored in these words is immense, especially if they are systematically compared with a person's real world experience.

At this point it might be appropriate to refer back to Bateson's logical types (1979) which, as increasing levels of "comparisons of comparisons", successively pack more information density into each level of increasing abstraction. All knowing is abstract, constructed and is, therefore, arbitrary. The only variable is the (number of) degree(s) of separation between reality, and the constructed reality of any given cognitive model currently in question. Some very abstract concepts provide powerful analytical tools for understanding or constructing meaning about the less immediately apprehensible processes of the environment. These mental constructs allow us to overcome somewhat the inherent limitations of our perceptual systems, surely a good thing.

In order for an analogy to be useful, the aspects that affect/effect the comparison must be significantly comparable. Characteristics of the elements being compared that are irrelevant to the analogy can vary without negatively affecting the use of the analogy. Thus, as long as we do not apply the standard of the literate mode of communication, which is based on assumptions of identical stable texts and which demands absolute and precise comparability in all respects, we can begin to see how computer-mediated communications may begin to achieve the flexibility and density of human communications. Once we accept the idea of the "approximate" reconstruction of data as a semantic data compression technique, following Shannon's mathematical model shows us how to use it. The degree of approximation must be matched to the communications context, but it should begin at the highest level of compression. As the context requires more detail, the "program" or decompression program works in an intelligent manner according to Shannon's procedure for using the least number of bits

on average to decode and reconstruct the original data. First, as much detail as is transmitted/stored at the next lowest level of logical typing is reconstructed. Then, as the "program" moves on, it uses a dialogical method to clarify details at lower levels of logical typing, *but saves bandwidth by only using this techniques as needed*. Consider the process of giving the description of John Doe to the person who does not know him and must meet him in a bar. The description starts out at the general level and then moves to the specific *in a guided, non-random way* through dialogical interaction.

As digital communications continue to develop, it seems likely that some form of relativistic communication strategies will eventually be employed. If we begin with the essential mutability and process orientation of digitally-coded information as it already exists and think back to Negroponte's paperback movie project where the computer will begin to reconstitute the specific data of the movie from a collapsed compressed data set, we begin to see how the digital mode of communication represents a return to the cultural characteristics of primary orality. I can already see one way to begin the semantic compression of the paperback movie which could work like those "books of the movie" that are published with the screenplay accompanied by numerous stills. Given an image to start with and a script for the scene, it is not hard to imagine how it might be possible to have a computer reconstitute an entire sequence. Because text is much more compact than images, a CD could hold hundreds of stills and hundreds of pages of script without difficulty. The implications, however, are that the computer program capable of accomplishing the semantic decompression of such a CD would be horrendously large.

What is more, such a system would have to abandon the absolute comparability of the stable text. Any program sufficiently complex to be able to accomplish this task would *not produce exactly the same uncompressed movie each time it was run*. The different versions of the movie would each be comparable in all significant respects, but they would not be identical. If two people were to see different versions and then meet and talk about their experience of the movie, they likely could not discern that they had seen "approximate" versions.

Thus, by beginning with the simple oversight about the implications of one word in the mathematical model of information, we can see how, if one is willing to be philosophical and to try to overcome (shall we say) mediacentrism, it may be possible to regain an efficiency of communication under the digital mode of communication that is capable of facilitating the drawing together of people under the shibboleth of McLuhan's global village populated by the retribalized mass of humanity.

Indeed, it seems that after a detailed investigation, another of McLuhan's aphoristic statements proves to be brimming with relevant information, provided, however, it is unpacked by the application of analogical thinking. McLuhan's version (1989:3) of the critique of information theory is typically succinct and artful: "All Western scientific models of communication are —like the Shannon-Weaver model— linear, sequential, and logical as a reflection of the late medieval emphasis on the Greek notion of efficient causality". Elsewhere he says the Shannon-Weaver communication model

is a kind of pipeline model of a hardware container for software content. It stresses the idea of 'inside' and 'outside' and assumes that communication is a kind of literal *matching* rather than resonant *making* (1988:86).

Once again McLuhan seems to have gotten there first and to have done it better. His anticipatory contributions seem to have been overlooked simply because most people are not willing to take the time necessary to fully unpack his statements, which are themselves examples of the semantic compression of information.

Chapter Six: Conclusions

I have attempted to examine in detail the implications of an increasing prevalence of computer-mediated communications that by all accounts is expected to continue and expand. There is reason to believe that as this process continues, it will be accompanied by significant social and cultural effects on all levels. My research led me to hypothesise that these effects might be patterned, and that the pattern might follow from the nature of the historical development of communications media. This research led me to develop a taxonomy of stages, or modes, of communication. According to this model, we are currently experiencing the effects of a transition to an electronic mode of communication, which is characterized by two phases: analog and digital. We are now beginning to enter the digital phase.

This taxonomy points to the identification, based around a degree of return to the social conventions of primary orality, of the changes which are associated with the rising digital mode of communication. I do not believe argument about details, such as whether or not the oral mode of communication should have a two-stage development with high and low oral phases, invalidates the overall analytical utility of this taxonomy. A specific analysis of the changes connected with the transformation to a digital mode of communication follows, which is rooted in McLuhan's concepts of art as a precise analytical technique for investigating the effects of our media mediated environment on our perceptions. I was inspired to consider at length Walter Benjamin's *The Work of Art in the Age of Mechanical Reproduction*, with the intent of updating it for the age of

digital reproduction in my attempt to discern the underlying patterns of the digital mode of communication.

I believe that my thesis is supported: the introduction of the digital mode of communication is leading to a return to orality and this process is accompanied by the rise of McLuhan's retribalized mass living in the global village. This is not, however, a utopian vision, and I wish to make it clear that my entire approach to the effects of media is a critical one. McLuhan himself was misunderstood, and he was accused of being a utopian thinker. In a 1967 interview with Gerald Stearn, McLuhan (279) defended himself against this charge:

There is more diversity, less conformity under a single roof in any family than there is with the thousands of families in the same city. The more you create village conditions, the more discontinuity and division and diversity. The global village absolutely insures maximal disagreement on all points... People leave small towns to *avoid* involvement... I don't *approve* of the global village. I say we live in it.

This reflects my own focus on the way that the development of all technology occurs within a social world, in which its practices actively work to shape the final articulation of the technology. That some articulations may be favoured over others by a certain technology is not a determinism.

Thus, I have attempted to offer some empirical evidence from my own ethnographic research on the Internet and on other computer-mediated communications, in support of my conclusion that the features of the digital mode of communication mentioned above will prove to be the favoured articulation, even in the face of attempts by certain groups to control these new media in order to maintain their position of power

by utilizing these media as a mechanism of social control. That this is not a given is implicit in my analysis.

In order to assist the ongoing project of understanding the new digital media, I proceeded with a critique of most contemporary communications theory, based on some oversights in information theory which infect the entire field. I do this in order to offer support for new theories of communication such as those of McLuhan, Schwartz, and Negroponte and Minsky.

Thus, in light of my investigation, I believe that I have supported my thesis, and have indicated the direction in which I consider digital media is moving. By using my analytical framework for further empirical study as events move rapidly ahead, I believe it may be possible to avoid some of the worst of the possible scenarios.

Minsky's ideas (1985) about the society of mind, which is comprised of multiple independent 'agents' whose processes are mutually opaque, support a weak version of AI theory based on philosophical arguments. If it is the patterning of information, rather than the substance, that is important in the production of intelligence, then this patterning must also apply to the form of the "computer" which is to run the intelligence algorithm. In other words, a weak form of AI based on the convergence hypothesis. Further support for these ideas is offered by Gardener (1983) and Bateson (1979).

If we believe that the hubris of AI and CMC researchers will continue to lead to advancements in technology that will result in computers inching towards the goal of becoming intelligent agents, this process will also inevitably lead to those computers being formally constructed like humans. If we push even further with the convergence

hypothesis, and assume that the material as well as the formal characteristics are important in the production of intelligence, then we weaken still further the claims of strong AI. I believe that we are already beginning to witness the proof of such a prediction in the beginning of the convergence and the cross-fertilization of the physical and biological sciences. Biotechnology and Rabinow's theories of biosociality point in the direction of "wetware" as the next developmental stage beyond silicon-based computer technology. Remember that silicon, which underpins computer technology, and the carbon of life processes, are elements with a valence of four. It was this similarity that prompted the early exploration in science fiction of the possibility of silicon life. However, when we draw attention to this fact in these terms it can be seen that it is possible that there *is* a relevant difference between these two elements as foundational technologies. Thus, it may well be that the future of computer technology lies with carbon, not silicon and that convergence will mean that computer engineering will become one and the same with bioengineering. If this happens then the questions surrounding this technology will also become ones of human concern, values, and ethics. The great concern about the Human Genome Project is one such example.

Hence, if convergence proceeds, there is no reason to believe that the process will not also lead to communication/information processes that more closely resemble those of life. And these processes have been highly refined by millions of years of evolutionary development around primary orality. Consequently, again it appears that the development of digital technology is likely to correspond to a return to a mode of communication that is oral in nature. It is possible that we will see Silicon intelligences in one form or

another or even artificial intelligences based on Carbon and biological processes but these intelligences would then be expected to be alien and not like us. This is not surprising since even in the natural world there are many creatures that can be considered intelligent that do not share our type of mind. Chimpanzees, with whom we share approximately 95% of our DNA, and Cetaceans who have massive brains and complex cortexes are somewhat alien intelligences for all of their relevant similarities.

However, in the meantime while waiting for these possible futuristic developments Foucauldian power as knowledge already surrounds us as C3I (Command, Control, Communications, Intelligence), whether we like it or not (Haraway 1990; Stone 1991; Levidow and Robins 1989). To ignore this fact is potentially dangerous. Electronic epistemology is an integral part of our contemporary reality as it is characterized by panoptic surveillance coupled to the control of corporate data-bases and fed back into us as one-way flows of positive feedback by the electronic mass media that characterize the already existing control of corporate capitalism over our cognitive universe. It is this force that structures more than anything else the current social uses of communications technology.

The effect of the inverse relationship between transportation and communication is one area that remains to be explored in detail. As digital communications advance there will no longer be any need to download information to your local drive (transportation of data). Instead you will just need to know where to find the location where the information you want is archived so that you can access that data remotely through telecommunication (communication of the data since you establish a link then

read but do not save or transport data permanently). Both of these information-handling strategies are currently being used. However, given the actions of those who hold power it is possible telecommunications will replace the transportation of local saves. If this occurs the proliferation of duplicated data will be replaced by centralized archival sites in a renaissance of the modernist ideal of centralization. All that is needed for the triumph of this centralist mode is the logic of efficiency and the costs of handling exponentially growing data.

This raises the spectre of Big Brother in the sense that in Orwell's novel one of the major undertakings was the constant and ongoing erasure of history. With the impossibility of detecting the editing or deletion of digitally-stored information the question arises of how to be sure that the information you accessed last time is still the same information this time. This problem is exacerbated by the limited involvement with information that is characteristic of information glut or overload. The chance is that no one would even notice the disappearance of huge quantities of data. Thus, questions are raised about the disposition of data and artifacts originally assembled with public funds such as the commercialization of the net backbone, or the licensing to private commercial services the monopoly rights to charge for access to information in publicly owned databases.

The question of the libratory potential of computer-mediated communications is a very important one in so far as we allow that changes in communicative structures are linked to changes in social practices. In 1948 Norbert Wiener (quoted in Brand 1987:212), the "father" of cybernetics wrote: "Of all [the] anti-homeostatic factors in

society the control of the means of communication is the most effective and the most important". The question of libratory potential also highlights the tension between Transnationals and the nation-state. However, in another sense both of these are beholden to the digital mode of communication for the efficiency that allows them to be rivals. Big Government and Big Global Corporations, both underpinned by Big Science may be seen as a new locus for Baudrillard's stable form of binary regulation (1983:134). Both are facilitated by the computer and digital communications. The bureaucracy and the transnational could not grow beyond a certain limit without the computer.

Nonetheless, the question remains: to what degree is it possible to limit the preferred articulation of the digital mode of communication. Already the global economy is computer-mediated communications. Money in its paradigmatic form exists as bits in a computer memory. It has already been transformed into the ultimate cult object. The automation of the international money economy has led to the global economy itself existing as flows of digital information between computers in different locals. The economy therefore becomes the flows of information itself not the money that these flows are supposed to represent (Brand 1987:260-1).

However, along with increasing sophistication "one of the by-products of our technology is an increasing dependency upon extraordinarily complex systems" (Lucky 1989:13). Vacca (1974) himself an engineer who designed such systems outlined the ways that these systems tend to fail. The possibility follows the relation in which an increase in the mean time between breakdown, such as from increases in efficiency, also

brings with it a tendency toward catastrophic failure. The problem is that it is impossible to predict just how or when such a failure will occur.

Jack Goody (1987:300) concludes his book *The Interface Between the Written and the Oral* with the statement that: "Cognitively as well as sociologically, writing underpins 'civilization', the culture of cities". But, It is important to point out that we never really were modern anyway. The power of the oral mode of communication which humans adapted themselves to for 99% of their evolutionary history is such that the limited epistemology of the literate mode of communication must be looked at as the historical aberration. Many of the characteristics of oral culture were merely relegated to the status of subjugated knowledges and were driven into the ground of the figure/ground relation. Magical thinking, religion, ritual, myth, story-telling etc. came to be associated with Third World or subjugated groups such as women, even though these continued to operate in dominant groups. However, anthropology, as a discipline that exists more than others on the boundary of the oral/literate interface, has more often than not found itself pointing out the ways in which Western rationality itself fails the test of logic when it is compared to the logic of these subjugated knowledges. The constant critique of Western scientific medicine made by medical anthropologists comes to mind as just one example.

Therefore, the critique of communications theory indicates a potentially useful project in attempting to outline and theorize the ways that communicative strategies operate to mediate between conflicting realities. We can take Paul Rabinow's (1986:241) prescription to heart here:

Epistemology must be seen as a historical event — a distinctive social practice, one among many others...We need to anthropologize the West: show how exotic its constitution of reality has been; emphasize those domains most taken for granted as universal...make them seem as historically peculiar as possible...We must...avoid the error of reverse essentializing; Occidentalism is not a remedy for Orientalism.

One way to accomplish this contextualization when faced with the beginnings of the digital mode of communication is to return to McLuhan's artist and their ability to reveal the *relation* between figure and ground. Negroponte is quoted by Brand (1987:83) as saying: "The impact of computers on the arts will be bringing out the artist in all of us". However, ideas of art and artists are culturally specific which prompts me to offer in replacement the generalized anthropological term shaman. This term incorporates the associated idea of the trickster — one who disturbs the sensibilities and thus reveals hidden relationships. At the MIT Media Lab artists are respected by the technical personnel who's approach to the artists they collaborate with is "respectful but not worshipful — they're regarded as hackers minus computers, one of us" (1987:83).

What is needed then to make sense of the effects of the changes in communication from the emerging digital mode of communications is trickster/shamans who are comfortable with computers and capable of interpreting the changes that have already taken place in order to guide us in the decisions we still face.

Appendix I: Glossary

AI	Artificial Intelligence: The field that is founded upon the assumption that it is possible to develop intelligent computers.
Algorithm	An algorithm is a set of step by step rules for mechanically solving a problem.
Analog	A format where information is represented by a continuously varying quantity where all values are valid. The opposite of digital.
Asynchronous	Communication that does not require both participants to be connected simultaneously but will wait for the other party to receive it. Email is asynchronous.
Back-up	A back-up is a duplicate copy of a computer file that is made in order to avoid loss of data in case of hardware failure.
Bandwidth	A measure of the capacity of a channel to transmit data. The wider the bandwidth the more information a channel can carry. Telephone wires have a narrow bandwidth, coaxial cable is wider and fiberoptic has a very wide bandwidth.
BASIC	A simple computer programming language that was popular with early hobbyists.
Baud	A standard way of measuring the transmission speed of data that varies. It is sometimes but not always equal to a rate of one bit per second. The higher the baud rate the faster data is transmitted.
BBS	Bulletin Board System: A dedicated computer system analogous to a regular bulletin board where individuals "post" messages for all to read and replies may be left by other users.
Binary	The base two number system which has only two digits: 0 and 1. In this system the columns are represented by 2 ⁿ .
Bit	Binary Digit: The units used in binary or base two math, either 0 or 1. Thus the binary number 1001 is four bits long.
Bot	A contraction of robot, the term is used in MUDs and MOOs where a computer program simulates a person or "character". A

simple bot might wait at the entrance to the MUD or MOO and greet new users and be able to answer a few simple questions.

Broadband	A descriptor for the bandwidth of a channel that is able to carry more than 1.5 million bits per second. This is enough capacity to transmit full motion video. It is opposed to the "narrowband" of telephone wires and the "wideband" that can carry stop motion video at 64 000 bits per second or more.
Broadcast	The familiar mass media are all broadcast media which have a single source with a multitude of receivers. It is opposed to narrowcast which has a limited number of receivers.
CAD	Computer Aided Design: A dedicated computer system that integrates automated drafting elements with specialized display features often incorporating 3D or animation.
Chaos	A mathematical term for describing unpredictable, but non-random systems in which the current state does affect future states. The weather is a chaotic system in which subsequent states may be predicted for the immediate future but not for the long term.
Clipper Chip	A computer communications chip developed by the National Security Agency which would allow authorities to easily monitor all transmissions on the internet.
Clock Speed	The highly stable electronic frequency that sets the standard rate that each computer instruction is handled by the hardware. A computer with a 25Mhz clock speed will be able to change internal states, such as by loading a number into memory, 25 million times a second. The same microprocessor running with a faster clock speed will be a faster and therefore more powerful machine.
Clone	Any computer, put together from off-the-shelf components, that is a fully compatible copy made by a second company of a machine made by an Original Equipment Manufacturer (OEM) such as IBM or Apple. An IBM clone is a copy of an IBM machine that was not made by IBM.
CMC	Computer-Mediated Communications: any communication that at some point is transmitted digitally.
CNC	Computer Numerical Control: A manufacturing system where a machine tool such as a lathe is controlled by a simple numerical

program which allows extreme accuracy, repeatability, automation, and simple retooling through changing programs. CNC is associated with post-Fordist flexible production.

Complexity	A branch of mathematics that is concerned with the theoretical limits to the efficiency of solving algorithmic problems. Some types of algorithms are inherently slower or require vastly more memory to solve a given problem than other types of algorithms.
Compression	A technique that reduces the size of a set of data by analyzing the redundancy of the data and substituting coded data for the actual data. A simple compression method might look for strings of consecutive 1s or 0s and replace them with a numerical representation of those bits. Thus a string of eight zeros: 0000 0000, could be replaced by the binary number for eight which is 1000, a savings of 50%.
CPU	Central Processing Unit: is the heart of a computer with Von Neumann architecture containing the microprocessor which is linked to separate memory and input/output devices which the CPU communicates with.
CRT	Cathode Ray Tube: also known as a picture tube the CRT consists of a phosphorus coated screen and one or more electron guns which allows an image to be rear projected onto the screen by scanning the electron beam(s) rapidly across the screen. Both a TV and a computer monitor are based on the CRT.
Cybernetics	The study of control and communication in the animal and the machine. Cybernetics is usually associated with the study of large complex systems with multiple feedback loops.
Cyberspace	The general term for any computerized virtual reality model that has incorporated a spatial metaphor.
Cyborg	Cybernetic Organism: an organism that is part biological and part machine in which both parts work together as one entity. A cyborg is distinguished from a robot which is pure machine and an android which is a robot that must resemble as closely as possible a human.
Dice	Dice are the tiny pieces of silicon that contain the actual computer circuits which have not yet had their wires connected or been

placed into chips Like paper money the dice are made in sheets and then cut up, tested, and packaged.

Digital	A system that operates with discrete units. The most common digital systems are binary, although other bases are possible. (See analog.)
Email	Electronic mail. A form of asynchronous communication where messages can be sent from one computer user to another.
Force Feedback	A control that has force feedback may resist a given input based on the inclusion of a feedback signal that has the effect of producing a force vector on that control.
Fractal	A fractal is a mathematical concept that incorporates the idea that objects may have a partial or fractional dimensionality.
Freenet	Freenets are large community-based computer networks whose ethic is free access for all users.
Generation	Computer design is said to evolve in generations. In PCs these generations correspond to the: 8086, 286, 386, 486, Pentium. Generally, each generation is taken to be at least twice as fast, twice as powerful and cheaper than the previous generation.
.GIF	A type of computer file that contains a digitized visual image.
Hacker	In its original sense, the term hacker referred to a person for whom computer programming had become a way of life. Hackers enjoy mastering computer systems through esoteric programming practices. This often involved acquiring unauthorized access to other computer systems. Recently the term hacker has gained the negative connotation of one who maliciously breaks into computer systems for the purpose of wreaking havoc.
Hardware	The actual physical machinery of a computer system.
Hypertext	A hypertext document is one that incorporates in its body links to cross-referenced information that may be selected with the simple press of a button.

Information Highway	Refers to the idea of a broadband network that will bring all interactive computer services into the home on a single line.
Interface	Any link between the human operator and the computer or the computer and another computer component is an interface. The keyboard is an interface, as is the screen.
Internet	The Internet is a broadband network of networks that links many computer systems together into one decentralized whole.
IRC	Internet Relay Chat is a synchronous, multi-user, realtime talk system. Many people can hold a computerized conversation together simultaneously on an IRC channel.
List	A list is a form of computer communication where a user can post a message which is then automatically relayed to all the subscribers of the list as an email message.
Listserv	Listserv is the automatic program that keeps track of who is subscribed to the list and distributes the messages.
Login	The process of gaining access to a computer account. Also the string of characters used to identify the user.
Mailbombing	The practice of sending a huge number of repetitive messages to a person who has egregiously disregarded the norms of the Net. This has the effect of filling up the person's incoming mail box so that they are unable to use their email. The practice will also draw the attention of the sysop who will want to know why the person was mailbombed.
Mainframe	A large, centralized, time sharing computer system.
Microprocessor	The heart of a computer system. It is a computer on a single chip.
Modem	Modulator Demodulator is a device that changes computer signals into audio signals which may be transmitted over a regular phone line.
MOO	Multi Object Oriented program. MOOs are MUDs without the allusion to fantasy role playing.

MUD	Multi User Dungeons are computerized games based on fantasy role playing games where players adopt a character and play against other characters in a computer-simulated world.
Multi-Media	A multi-media computer system incorporates text, graphics and sound into a single, integrated package.
Negative Feedback	The process whereby a portion of an output signal is reintroduced to the input of a system in order to control the system.
Net	A general, all-purpose term for the large, global computer networks.
Netiquette	Net etiquette. A loose set of social conventions that govern behaviour on the Net which is enforced through informal sanctions such as mail bombing. Correcting the spelling and grammar of other people's posts is an example of poor netiquette.
Network	A series of computers all linked together by a computer communications system.
Newbie	A newbie is a person who is new to computer networks and does not yet understand all of the conventions.
Newsgroup	A newsgroup consists of a series of messages organized around a topic and grouped by subject into "threads."
Noise	Any unwanted interference with a communication signal is considered noise. Static is noise.
On-line	The opposite of off-line. A computer is on -line when it is connected to the system, as opposed to acting as a separate stand-alone system. A person who is logged in to their account is said to be on-line.
Parallel Architecture	The opposite of Von Neumann Architecture. All processing involves breaking up a program into small discrete units that may then be run simultaneously in several microprocessors.
PC	Personal Computer. A small and powerful stand-alone computer dedicated to a single user.
Post	A message sent to a newsgroup.

Quantum	A discrete state separate from all others with no available intermediate states. All digital systems are quantum.
Real Time	The interacting with a computer with no time delay at all. Synchronous communications take place in realtime.
Root Access	The highest level of computer access granted to sysops. Root access allows the sysop to go anywhere on the system and examine and alter any file.
Shareware	Computer programs which are distributed for free and which rely on an honour system, where people who use the program voluntarily send their monetary contribution to the author of the program.
Signal	The component of a communication that carries the information content.
Software	Any program which is loaded and run on a computer.
Stochastic	A process is stochastic if it combines a random element with a non-random process of selection which constrains the result in a patterned manner.
Synchronous	Communication that requires both participants to be connected at the same time. IRC and TALK are synchronous communication.
Sysop	Systems Operator. The person responsible for keeping a computer system up and running and who fixes problems.
Thread	A group of postings to the Net which is made up of an original message and the subsequent replies to that post under the same subject heading. Any given newsgroup will have several threads running on it concurrently about different topics.
UNIX	An operating system for complex, time-sharing computer systems that was designed in 1969 at Bell Laboratories.
Upload	Sending a file from your local computer to a remote system.
User-I.D.	The name that a person types into the computer when they log in which uniquely identifies that user.

- VDT** A Video Display Terminal is the television-like monitor that displays the output of the computer in graphic form for the user.
- Von Neumann Architecture** The model all standard computer systems are based on where data is stored in a separate memory and transferred to the CPU where logical operations are performed and the resulting data is then stored back in memory. The whole sequence is linear and logical. (See parallel architecture.)
- Web** The Web is short for the World Wide Web (WWW). It is another style of Internet interface that is graphics-based, multi-media, and hypertext-oriented. It is the fastest growing application of CMC today.

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