This is to certify that the

thesis entitled

**LIVING REAL EXPERIENCE IN VIRTUAL NETWORK ENVIRONMENTS IN PIERRE TEILHARD DE CHARDIN**

presented by

**GILDASIO MENDES DOS SANTOS**

has been accepted towards fulfillment
of the requirements for

**MASTER** degree in **DIGITAL MEDIA ARTS**

Major professor

Date April 28, 2000

| DATE DUE | DATE DUE | DATE DUE |
|---|---|---|
| SEP 0 3 2002 | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

# LIVING REAL EXPERIENCE IN VIRTUAL NETWORK ENVIRONMENTS IN PIERRE TEILHARD DE CHARDIN

By

Gildasio Mendes dos Santos

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF ARTS

Department of Telecommunication

2000

ABSTRACT

LIVING REAL EXPERIENCE IN VIRTUAL NETWORK ENVIRONMENT IN PIERRE TEILHARD DE CHARDIN

By

Gildasio Mendes dos Santos

As people the world over begin to express an increasing interest in navigating in virtual spaces, we must have a foundation that considers the physical and psychological aspects of humans exploring this new experience of time and space.

This thesis will explore scientist Pierre Teilhard de Chardin's concept of the evolution of the human brain ("noosphere"), the expansion of technology for the development of people and nations (global village), the development of computers as an extension of the human mind and body ("electronic machines"), and lastly, the internet as the vehicle that will unite people around the globe (convergence). This thesis is fundamentally based upon the studies of Teilhard de Chardin, but includes literature and research by authors influenced by his vision, and recent studies relating to the human brain, Artificial Intelligence, virtualization of economy and culture, computers, the internet and cyberspace.

For

My mother, Edith, with love
St. John Bosco, with gratitude

I w

who

fai

acc

the

♦ M

t

E

♦ Dr

hi

th

in

vi

♦ Dr

an

th

en

♦ Fr

in

**ACKNOWLEDGEMENTS**

I would like to express my gratitude to the many persons who have provided inspiration, patience, ideas, criticism, faith, passion, and all manner of assistance for helping me accomplish my studies. This work gained enormously from their support. In particular, I would like to thank:

- My parents, for their loving patience and support throughout these six years I have been living between Europe and the United States.
- Dr. Thomas Muth, mentor, colleague, and dear friend, for his wise guidance, energy, and constant dedication. From the very beginning, he encouraged me to follow my inspirations and trust myself to enter the world of virtual reality technologies.
- Dr. Frank Biocca, for his wonderfully capable research and creativity in Virtual Reality. He introduced me to the finer points of computer-mediated communications, encouraged me, pushed me, trusted me.
- Fr. Afonso de Castro, for his encouragement and invaluable advice.

- Dr. Duncan Rowland (Manager, Media Interface and Network Design LAB - MSU) and colleagues for turning ideas into beautiful visuals.
- Fr. Joseph Winkler (Provincial of the Salesian Province - Campo Grande - Brazil) and Fr. Joseph Marinoni (Rector of UCDB, Salesian University) for their support.
- Debbie Johnson (Secretary of the Department of Telecommunication - Michigan State University) and Rachel Miller (Secretary of the Media Interface and Network Design Lab - Michigan State University) for their kindness and gentle guidance.
- Fr. Francis Preston (Provincial of the Great Britain Salesian Province) and Fr. Nicholas Reina (Provincial of the Salesian Province - California - USA) for their friendly support.
- Fr. Fabio Pasqualetti (Professor of UPS - Salesian University - Rome - Italy) for his insights and strength.
- Dr. Jerry Mattson, Lisa Briggs, and Melissa Burrier for their valuable suggestions.
- Bishop Carl Mengeling (Diocese of Lansing, Michigan), Monsignor Michael Murphy (Moderator of the Curia), Monsignor David Stotenbur (Pastor of the St. Thomas Aquinas parish), Fr. Carl Pung (Vicar), and Fr. John

Byers (Pastor of the Immaculate Heart of Mary parish) for their encouragement and friendship.

- Finally, all the professors and colleagues at the Department of Telecommunications at Michigan State University, who are working with competence and dedication for offering to the people of this millennium the possibility for living real experience in virtual network environments.

**TABLE OF CONTENTS**

## CHAPTER I -THE PHENOMENON OF COMMUNICATION

*Television was still in its infancy when the famous scientist Pierre Teilhard de Chardin died on Easter Sunday in April 1955. Not so long ago, a world existed in which television was considered only for the "elite." Compare that perception to today's average household, which contains a minimum of two television sets! Technology has literally transformed our world into a new dimension.*

*In the past one hundred years, our world has endured two World Wars and many changes in our political system. New media-coverage techniques have evolved, and new theories on thinking and thoughts are continually developing. However, all of this progress does not occur without causing any division or insecurity. Authoritarian political systems generated a tight and narrow cycle of new thoughts and ideas.*

*Teilhard developed his whole vision of man in a context characterized by a cartesian dualism between body and mind and a platonic view based on the separation between body and spirit. In the 40s, the idea of evolution was not well accepted in scientific circles. The religious denomination he belonged to viewed the theory of evolution as in opposition to the traditional concept of creation.*

The

Tes

con

pale

thec

livi

cont

func

opera

conne

const

examp

inclu

radio

conve

the g

his p

visic

He br

*The world was divided by many ideologies. During this time, Teilhard, a priest and scientist, lived in China and conducted the majority of his scientific research in paleontology.*

*After many years of study, Teilhard explained his theory and visions by proposing that human beings are living in a "global village." Just as the human brain contains the configuration of billions of neurons needed to function, the world of computers and modern technology operates as a genesis for the development of globally connected thoughts and networks. These environments are constantly being generated and are ever evolving. Take for example the physical aspect of the world's network - which includes antennas, satellites, wires, cellular phones, radio, television, and computers - that form a planetary convergent and democratic culture of communication around the globe. Some of Teilhard's most famous work describes his perspective on the most fundamental concept of his vision: evolution.*

## The Evolution

Evolution[1] is the central point of Teilhard's vision. He brought forth a new explanation of how life develops

into

have

incre

conso

conso

which

the u

intro

relat

of hi

the f

two d

'tang

assum

in sc

compo

compo

and h

compl

is 'r

ever

direc

into higher forms. According to his theory, human beings have evolved from elementary particles, and are increasingly "complex" creatures with advancing levels of consciousness. Teilhard called these levels of consciousness the Law of Consciousness[2] and Complexity[3], which he considered to be the most fundamental aspect of the universe. He widens his scope on this theory by introducing the Law of Consciousness and Complexity as related to the concept of energy.

In his famous book *The Phenomenon of Man* (1947), some of his most relevant work was accomplished when he codified the force present throughout the evolutionary process into two distinct types of energy, "radial" energy and "tangential" energy[4]. Teilhard's early work involved the assumption that essentially all energy has a physical and, in some sense, spiritual nature, with two different component faces, that of tangential and radial.

He divided each particular element into two separate components. The first is the force, "tangential energy," and he links the element with all others of the same complexity as itself in the universe. The second component is "radial energy," drawing the element forward towards an ever greater complexity and centricity and ever more directed towards the future.

"It

gre

spi

elab

whic

tang

instr

early

its e

consc

to ex

organi

and pr

genera

energ

devel

(atom

as "l

self-

"thou

refle

"It is the radial energy component that develops ever greater clarity of interiority and higher forms of psychic spirituality as one goes up the scale of beings," elaborates Grau (p. 124).

In order for human energy[5] to have full harmony from which to create a more complex design, it must include both tangential and radial energy. The accumulated energy is instrumental in the growth of something, especially in its early stages. The ability for the new creation to go beyond its earliest form and to acquire a higher level of consciousness implies that it is crucial for an inner force to exist.

In his research, Teilhard discovered that those organisms in which the tangential energy was significant and present (known as "life within"), a consciousness was generated. In inanimate objects he called tangential energy (known as "pre-life") the first period in the development of life, such as the elementary particles (atoms, protons to galaxies). In the second period (known as "life"), he determined that beings are not self-reflective. It is during the third period (known as "thought") that humans emerge with the capacity of self-reflective thinking.

tange

by ex

Consc

of ev

the p

the p

elect

singl

trans

'with

'with

perfe

that

influ

their

becom

being

in ma

inner

refle

Through his stunning work in defining the concept of tangential and radial energy, Teilhard broadened his theory by explaining the Process of Complexification and Consciousness. He views this process as the fundamental law of evolution.

Once the process of complexification is established, the process of transformation is added. This process allows the potential of the energy to evolve from the level of electrons to that of atoms, from atoms to molecules, from a single molecule to vastly more complicated ones.

What generates the process of complexification and transformation according to Chardin, is the energy of the "within." Each small particle carries an inner force "within." This force "within" seeks its own development, perfection and destiny.

Throughout *The Phenomenon of Man*, Teilhard emphasized that the elements of the world are actually able to influence and mutually penetrate each other by reason of their "force of within". This mutual penetration grows and becomes increasingly perceptible in the case of organized beings (for example, from ape primates to man), and finally in man it reaches a maximum degree of consciousness. The inner essence of the mind gradually became human and self-reflective, and now that it is mutually stimulated by

prox

has

of t

as t

expa

of m

conv

to wh

shoul

evolu

have

on th

begin

one a

Itsel

techn

into

compl

creat

being

techn

proximity, it is as though a movement of ripples or waves has been created and continues to expand over the surface of the globe by infiltrating more and more into each other as they are generating a network of thoughts, feelings, and expanding globally.

Quite poetically, Teilhard expresses how the evolution of man and the universe has a purpose. He was deeply convinced that "there is an absolute direction of growth, to which both our duty and our happiness demand that we should conform. It is the human function to complete cosmic evolution" (p. 132). The billions of humans in the universe have a purpose and direction. The purpose of human beings on this planet is to "leave the state of isolation and begin to discover in each other not merely the elements of one and the same thing, but of single Spirit in search of Itself" (p. 132).

As our community shifts toward a new frontier of technology, our humanity has the ability to metamorphosize into becoming something it has never been before - completely and globally united as one mankind. Teilhard created the term "noosphere" to describe this new space being organized and increased through the advancement of technology.

defin

'the

the l

simil

indiv

aura.

the v

(p. 2

refle

Teil

an i

iden

that

curs

the

To T

inte

prop

to r

mome

## Noosphere

In his remarkable work *The Phenomenon of Man,* Teilhard defined the word "noosphere" ( *noos* in Greek means mind) as "the living membrane which is stretched like a film over the lustrous surface of the star which holds us. It is similar to an ultimate envelope taking on its own individuality and gradually takes on itself like a luminous aura. This envelope was not only conscious, but thinking, the very soul of the earth"
(p. 262).

The human mind is the consciousness of a self-reflective being, the highest form of life on earth. Teilhard's impassioned beliefs assert that every person is an individual, and each is aware of his or her personal identity (individual consciousness). However, Teilhard adds that what we are aware of is only the nucleus which is ourselves. The interaction of humans extends from one to the other, something proper to each one and common to all. To Teilhard, the fact that human beings are capable of interacting with each other suggests that there is a propelling force which is laying the foundation for humans to reach a higher reality than what is known at this moment. Teilhard's distinctive message is that there is an

cm

des

uni

also

the

worl

cereb

human

ethos

of co

from

thoug

netwo

cover

singl

plura

toget

unani

futur

the p

'coll

omnipresent force guiding humanity toward their ultimate destination.

As the population and the sense of being collectively united grows, Teilhard's interpretation of the noosphere also increases. With the advancement of communication and the interdependence of the technological and industrialized worlds, the intensification of research intensifies the cerebralization of the human mind, the development of humankind, and the improvement of human spirituality, arts, ethos, and sciences.

To him, as this process occurs, there is a movement of consciousness from the individual to the social, and from the multiple to unity. A network of feelings, thoughts and spirituality covers the earth with an immense network of energy. "The idea is that of the earth not only covered by myriads of grains of thought, but enclosed in a single, vast grain of thought on the sidereal scale, the plurality of individuals reflections grouping themselves together and reinforcing one another in the act of a single unanimous reflection" (p. 251). Teilhard believed that the future of men will depend largely on how they will explore the potential of the brain collectively.

He described thinking collectively as having a "collective mind" [6]. With the constant pace of additional

techn
that
thoug
the d
reali
again
the s
.
from
multi
cultu
visua
earth
thoug
envel
corre
of e
expl
Huma
elec
comm
huma

technological developments, Teilhard passionately deemed that human beings will live in a global network of thoughts. "Humans had lived in a narrow world, unaware of the dimensions of time and space. Now," he said, "a new realization arose: time and space are organically joined again so as to weave together
the stuff of the universe" (p. 218).

. In Teilhard's opinion, this immense network coming from the same physical base should consequently become a multiple and convergent network of knowledge, codes, cultural and human interests all over the earth. He visualized this convergent scenario in a few words: "The earth is not only becoming covered by myriads of grains of thought, but becoming enclosed in a single thinking envelope, a single unanimous reflection" (p. 251).

As a consequence of the increasing population and the corresponding expansion throughout the world, the creation of electronic communication became necessary. Teilhard explicitly mentioned radio and electronic machines. Humanization is accomplished by communication, by building electronic machines and spaces that offer physical communion, face-to-face contact that will spread to all human beings everywhere.

## Electronic Machines

In Teilhard's predictive visions, he imagined that all humans would steadily find methods to communicate creatively using the potential of technology. He impressively projected "electronic machines" as the link that would enhance their knowledge and interest. Amazingly, more than sixty years ago, he felt that these "astonishing electronic machines" - which today can clearly be interpreted as computers - are related to the power of human brain. He addressed this topic in his written work in *Man's Place in Nature* (1950):

> *Here I am thinking of these astonishing electronic machines by which our mental capacity to calculate and combine is reinforced and multiplied by to the process and to a degree that herald as astonishing advances in this direction as those that optical science has already produced for our power of vision.*

As stated earlier, Teilhard envisioned that the advancement of sciences would lead the humanity toward higher technological progress, with better relationships and cultural exchange between people. It was Teilhard conviction that if humanity were to transcend barriers of culture, geography, and ideology through the development of technology, then people from different parts of the planet would cooperate for the development of humankind and would

becc

and

esse

Mach

Toge

mach

virt

Man'

Teil

unfo

stat

begu

the

the

neur

become, ultimately, an interconnected network of thoughts and knowledge.

It can be simply stated that technology becomes essentially the extension of human beings. Electronic Machines are, therefore, components of human beings. Together they form a symbiosis.[7]

An indispensable part of the symbiosis between men and machines is the convergence of people for building a virtual space. Again, in Teilhard's modern thinking in *Man's Place in Nature* (1950), he declared:

> *Investigations in the past was isolated, but today we find research students are numbered in the hundreds of thousands-soon to be millions and they are no longer distributed superficially and at random over the globe, but are functionally linked together in a vast organic system that will remain in the future indispensable to the life of the community"* (p. 106).

In the early stages of scientific knowledge, Teilhard's projection of what was yet to come is ironically unfolding before the world's eyes. Quite powerfully, he stated in *The Phenomenon of Man,* "men yet has only just begun to take a scientific view of his own significance in the physical world" (p. 33). Evolution, to Teilhard, becomes the basis for his concept of virtalization.

Teilhard demonstrated that brain is a network of neurons. Once convinced of the phenomenon of the collective

mind, Teilhard went on to describe time and space, which represent the multiple and complex environments for humans to communicate the potential of thoughts and knowledge. This new dimension of time and space is called virtuality.

The genesis of communication in his vision is essentially virtual. Teilhard saw in virtual space and time the possibility for humans to explore the cultural, artistic, erotic, spiritual, and ethical dimensions of life in virtual spaces.

## CHAPTER II - THE GENESIS OF VIRTUAL COMMUNICATION

*In the preface of* The Phenomenon of Man *in March 1947, Teilhard wrote he was mainly interested "in the whole phenomenon of man. What I have tried to do is to choose man as the center" (p. 29).*

*Teilhard philosophizes that humans are a whole with the world. His theory of this relation, embeds the view that there is a dimension that is not visible, but representative; that is not concrete, but is metaphorical; that is not merely physical, but symbolic. This space beyond the formal space, the time beyond the mechanical time, creates a new level of meanings (such as language, emotions, imagination, desire, faith, belonging, art, eros, and ethos) that are complementary to the physical world and vice-versa.*

*The expression of his virtual vision of communication is essentially his most original work. Teilhard practically introduced the new concept of time, space, and identity in virtual space. He insisted that the relationship between the brain and electronic machines can be affective, and even spiritual. He postulated that the virtual space is a new dimension of relations - that cyberspace is the place for discovering the new potential for virtual experiences*

of co

techn

virtua

psych

that

early

experi

commu

Age c

the i

poten

commu

is kn

inter

Virtu

what

will

more

domai

longe

peopl

*of communication. As the world enters a century of digital technologies and virtual spaces, it is in such areas as virtual reality, artificial intelligence, internet and psychology, policy and e-commerce, privacy and cyberspace, that Teilhard's original vision is truly foreseen. His early thoughts are actually coming to life and literally experienced in today's exchange of what is known as virtual communication.*

*At a time when television was a new invention and the Age of Information was not even dreamed about, Teilhard had the intuition that the future would need to discover the potential of virtual space as it influenced human communication. More than sixty years after his death, what is known as the virtual is manifested in the form of the internet - cyberspace, cyberculture, cybercommunities. Virtual communication is becoming a new way of life. But what is it all about? What societal changes and motivations will come about as this new model of communication becomes more predominant in our daily life? Will a new learning domain come into existence through our acceptance of no longer requiring a shared physical presence between two people who want to communicate?*

is un

Era."

rapid

examp

resea

a med

impli

commu

techn

conce

part

to as

our p

defi

cult

on th

theor

life.

virt

psych

## A New Concept of Communication

It is crucial to consider the transition that society is undertaking as it enters the "Information and Knowledge Era." This transition is continually encouraged by the rapid technological advances in telecommunications. For example, Biocca and Levy (1995), who have been developing research and studying the phenomenon of virtual reality as a medium for the masses and the social and cultural implications that follow, have offered a new concept of communication. They believe the virtualization of technology will extend from the lab to the home, that the concept of virtualization and the technology will become part of humans' everyday life. Their research prompted them to ask these questions: How will virtual reality influence our perception of reality? What are the legal issues defining communication in virtual reality? What kinds of cultural trends will this technology encourage?

The increase of people interacting on-line, especially on the internet, have given rise to new studies, new theories, and new standards being set in regard to virtual life. Hundreds of studies regarding the authenticity of the virtual experience have been gaining the attention of psychologists, computer experts, and educators (Strate &

Jacobs

These

the e

exper

chat

cyber

that

horiz

ways.

disem

emerg

conne

withi

becom

the s

inclu

Jacobson & Gibson, 1996; Markam, 1998; Springer, 1996). These professionals are also asking important questions: Is the experience of being online a real or virtual experience? Is the experience of those who go into on-line chat rooms, support groups, virtual communities and cyberspace a real one?

It is now nationally and internationally recognized that computer-mediated communication is expanding the horizons of the human experience in new and unfamiliar ways. What does it mean to have, or to be, a self in the disembodied space of the on-line arena? How can this newly emerging society, known as an "on-line" community, become connected, committed, and even aware of their own roles within the community as this new way of communication becomes integrated into the world?

## The Concept of Real

> Webster's Dictionary (1993) defines the word *real* as "Authentic, genuine … not artificial or counterfeit." (p. 1890).

The "real world" is widely known and considered as the space where humans experience life, relations, and it includes the sense of time and space. The real is the space

that

time,

asynch

the e

data.

dwell

deter

area;

seaso

as tw

tradi

terri

citie

of

the t

rela

'bei

or a

that offers the authentic experience of reality. In real time, also called synchronous processing (as opposed to asynchronous processing), there is the occurrence in which the event remains at a distance from its registration as data.

Physically, all people live in a limited space. People dwell in specific geographical areas; they are born in a determined time and place; they reside in a determined area; they are familiar with laws of the earth such as the seasons and the calendar. Space and time can be thought of as two important factors of human existence.

As Poplin (1972) indicated, "the notion of community traditionally refers to such unity of social and territorial organizations as hamlets, villages, towns, cities, and metropolitan villages," thus invoking the sense of "community as place" (p. 124). Cohen (1985), notes that the traditional sociological studies of community truly relates to the sense of common values and cultural habits.

## Searching for a Virtual Meaning

The Webster's Dictionary defines the word *virtual* as "being in essence or effect, though not formally recognized or admitted."

The concepts of virtual and real have traditionally viewed as opposites. Why are these concepts conventionally defined as such? Can a new position on the concepts of virtual and real be interpreted into a new dimension?

According to Annette Markham (1998), the prejudice against virtual as not real is present in our culture and traditional education. "Its use in the areas of fiction literature, movies, and electronic fantasies in space has practically reinforced the composition of real and virtual as opposition. This idea is found in current vocabularies and ways of thinking" (p. 119).

She notes the consequence of this dichotomy permeating the different areas of human knowledge when she says:

> *I realize now that when many writers (myself included) describe cyberspace, they use the terms reality and virtuality in traditional ways. We presuppose a binary composition and opposition between real and virtual. This help us integrate various communication technologies into current vocabularies and ways of thinking. We use real (and whatever we term its opposite, virtual being the trendy choice at the moment) to juxtapose nature versus technology, referent versus sign, science versus fraud, genuine versus reproduction, authentic versus fake, human versus machine, and so forth (p. 119) .*

Authors such as Richard MacKinnon (1998) try to define the term *virtual* as an interface space between the real and the virtually real. "The primary difference between the real and the virtually real is the interposition of some

mediating and transforming agent or interface between the senses and the shared perception" (p. 4).

MacKinnon seems to define *real* as that which is experienced by the senses and *virtual* as the space between the senses (interface).

Keeps (1994) attempts to find a semiotic definition of the virtual, asking, "If the virtual can offer the complete range of sensory experiences available…and even optimize those experiences such that the real comes to seem a pale shadow of the virtual, how will one still differentiate between the sign and the reference?" (p. 2).

Until the early 1990s, the term *virtual reality* was practically unknown. Beginning in 1991-92, the media focused their attention on the "revolutionary technology that allowed people to enter computer-generated worlds using a helmet and glove" said Schroeder (1996, p. 1).

According to him, the discussion about what is real and virtual started to propagate in the area of virtual reality. One of the challenges in virtual reality is the antirealist approach that does not consider virtual experience as real (p. 3). Schroeder opens up the possibility of the virtual present into the categories of the real.

There are philosophical studies related to virtual reality using the platonic image of the cave to further explain the genesis of the virtual (Zettl, 1996; Heim, 1996).Works from the late twentieth-century focus basically on the hyperreal, moving closer to the virtual (e.g., Baudrillard, 1988; Benedikt, 1991; Rheingold, 1993).

Pierre Levy (1998), a French philosopher, wrote about technology and philosophy and defined the virtual as a "pretense potential." He considered the original meaning of the world "virtual" since it was derived from the medieval Latin - *virtualis* - he defined it as a strength or power. "The virtual is a fecund and powerful mode of being that expands the process of creation, opens up the future, injects a core of meaning beneath the platitude of immediate physical presence" (p. 27).

. One of the original pioneers of virtual reality was Jaron Lanier, who argued that communication can go beyond the verbal language or body language to take on "magical, alchemical properties." Heim (1993), who studied the metaphysical aspects of virtual reality, interprets the concept of virtual as postulated by Lanier as the "post-symbolic communication." (p. 116).

Heim's interpretation of Lanier's work suggests that we accept the virtual world as not totally real:

> *A virtual world needs to be not-quite-real or it will lessen the pull on imagination. Something-less-than-real evokes our power of imaging and visualization. Recall the legend of the vanishing artist. The magic in the story comes from the cross-over of three-dimensional to two-dimensional frameworks. On another level, the magic of the story comes from our ability to cross over from the words of the narration to an inner vision of the sequence of virtual events. The story relates a legend about the power of symbols while exhibiting that power. Imagination allows to use what we read or hear to reconstitute the symbolic components into a mental vision. The vision transcends the limits of our bodily reality, so that from the viewpoint of bodily existence, imagination is an escape, even though imagination often introduces new factors into our lives that sometimes cause us to alter actual circumstances (p. 133).*

Markham (1998), who researched people on-line for three years, assumed the position that virtual experience online is authentically real:

> *As I analized what people said, I began to understand that real and its opposite, not real, are becoming less valid frames, not because we are not having real experiences, but because online our experiences cannot be classified into binary states. Even the term virtual, it defined as nearly real, doesn't encapsulate online experience. For these participants, every experience is as real as another. This makes sense intuitively. For most of us, every experience is an experience, to the extent that it is lived. If it makes sense to us and feels like it is happening, how could it not be real? (p. 115-116).*

When the experience of the virtual is related to sexuality[8] researchers have wondered how ongoing digitalization will affect the status of subjectivity. In considering on-line desire, fantasies, and eros, the

question has been raised regarding how much the virtual eros is real. Is sexuality in the internet real or virtual?

Zizek (1997), writing about cyberspace and subjectivity, affirmed that "In Cyberspace, we witness a return to *pensee sauvage*, to 'concrete', 'sensual' thought: an essay in cyberspace confronts fragments of music and other sounds, text, images, video clips, and so on, and it is this confrontation of 'concrete' elements which produces 'abstract' meaning..." (p. 131).

Mark Lajoie, *Psychoanalysis and Cyberspace* (1996), believes that the convergence of virtual reality and network technologies is the product of desire and eros. For him, communicating virtually offers more possibilities for the expression of eroticism and desire than even communicating personally. He asks:

> *What differentiates talking in person from talking through the network? When I talk with someone face to face, the only medium I employ is language and my own voice ... Chat may allow me a range of communication possibilities, such as multi-user chats, and some conventions for displaying emotion or tone can also be used (p. 153).*

According to a group of researchers in the area of virtual reality (Moser & MacLeod, 1996), the Art and Virtual Environment has brought forth a new perspective between technology , arts and aesthetics. Using virtual

technologies, artists, painters, musicians, and writers, challenge traditional conventions in art, and suggest a new relationship between the viewer and the viewed.

In describing a virtual geography, Wark (1994) argues the virtual is a real experience that goes beyond the limits of the familiar terrain where we sleep, and work:

> *We live every day also in another terrain, equally familiar: the terrain created by the television, the telephone, the telecommunications networks crisscrossing the globe. These vectors produce in us a new kind of experience, the experience of telesthesia - perception at a distance. This is our "virtual geography," the experience of which doubles, troubles, and generally permeates our experience of the space we experience firsthand"* (introduction).

In the arena of developing a virtual ontology, there are probably more questions than answers. Recently, virtual reality concepts, the development of the internet, and the interest in cyberspace have raised interest for the virtual among computer areas, psychology, education, and philosophy.

The discussion about virtual communication is new. The development of the internet has raised several questions, such as: How is the virtual related to the real? How real is the experience in virtual space? How can the non-referential world of virtual reality affect people physically, psychologically, and even aesthetically? How

authentic and secure is the use of virtual space for developing electronic democracy, electronic commerce, and virtual relationship?

Teilhard believes that the virtual is the potential of the real. In other others, the virtual is part of the real. How does Teilhard formulate this base for a virtual reality? Teilhard's concept of virtual originates from the concept of the "within" and the "without."

## 'Within', The Egg of the Virtual

. In order to explain the "within" Teilhard defines another word, "without." "Without" refers to the external aspect of reality: what is measurable, the aspect of reality that has metrical proportion. In contrast, the "within" refers to that aspect of reality that is intangible. They correspond to that something which emerges; i.e., that which is more than the sum of its parts.

The within is present in all groups of molecules and organisms, embedded in the physical and spiritual elements as an internal unity, which is formed in the synthesis of the parts. Even an individual cell has an internal unity which can be thought of as a within. For humans, the

within produces its own consciousness[9] , a self-reflexive way of thought that is in a continuous process of evolution.

Provenzano (1993), identifies the insight in Teilhard vision as the complementing interior-exterior of things. "The fundamental insight of Teilhard rests on the vision that reality at all levels is composed of both aspects" (p. 146).

In explanation of the two energies, Teilhard argued, "We are perfectly well aware in our concrete actions that the two opposite (within and the without of things) forces combine" (p. 63).

Basically, Teilhard defined the virtual mechanism inside of the molecules and neurons, inside human consciousness and self-consciousness.

The basic question: How does this personal process of virtualization become collective, expanding to the social, the cultural, and the technological dimension? In other words, if there is a process of virtualization inside the physical elements (neurons), and psychological entities (men), how can this personal definition of psyche be applied to an individual human mind as well as to a collective intelligence? How does the relation of

interiority or sensation, affectivity, become applied to machines, for example?

In order to explain these affective relations, Pierre Levy (1998) used four factors. Rather than limit the conception of what is an element of the psyche, he provided a definition of the psyche that can be applied to an individual mind as well to a collective intelligence. He defined "an integral psyche," one that is capable of affect and can be analyzed along four complementary dimensions:

- Topology: The psyche is structured at each moment by its connections, systems of proximity, or specific space: associations, systems of proximity, or specific space, associations, connections, paths, gateways, switches, filters.

- Semiotics[10]: Mutant hordes of representations, images, signs, and messages of various shapes and kinds (aural, visual, tactile, diagrammatic) people in the space of connections.

- Axiology: The representations and regions of psychic space are associated with values, either positive or negative, depending on the different measurement systems.

- Energics: The tropism or values attached to images can be strong or weak. All psychic activity is irrigated and animated by an energic economy involving the movement

or immobilization of forces, the assignment or mobilization of values, the circulation of energy, the investment or divestment of representations, connections, etc. (p. 131-132) .

According to Levy, the operations of the psyche are parallel and distributed rather than sequential and linear.

> *A psyche constitutes an interiority. Its topology is not a neutral container, a pure system of coordinates, but a qualitative and differentiated space whose component parts are all related to one another and form figures. Signs and messages, by circulating through and populating the space, by constantly referring to one another, and by actualizing connectivity, also help create the interiority of the mind (p. 133).*

Teilhard's suppositions do not include these four dimensions, but he uses two of them to explain how the subjective operations of the psyche or mind "within" (subjectivity) is in reciprocal implication and dependent on environmental qualities ("without"), an outside environment that continues to provide new objects, new practical or aesthetic configurations for it to inhabit.

To include Teilhard's theory in this discussion, it is necessary to consider his concept of the "within", what he called "spiritual." We can, therefore, complement Levy's four dimensions when we connect Teilhard's important dimension:

- Spiritual[11]: the psyche is involved with the self-sense of being, the aura of transcendence by the sense of belonging, the sense of finality, the sense of being part of overall creation.

To Teilhard interiority is explained by the inner force of the "within", as already pointed out.

Levy believes that interiority is formed by the dialectic relation between the signs and messages by circulating through and populating the space, by constantly referring to one another, and by actualizing connectivity also help create the interiority of the mind. "Values mutually determine one another and form a system … This internal self-understanding depends upon how an individual can analyze and understand the role that others play in one's life. he self-understanding process is built in a continuous effort for understanding others." (p. 133).

The world, the physical universe, is a particular instance of the subjective world that surrounds, impregnates, and sustains the context in which the message is transmitted. The subject is its world, the world here being understood as everything that affect envelopes. To say that the psyche is open to the outside is something of an understatement. It is nothing but exteriority - but an exteriority that is infiltrated, energized, complicated,

transubstantiated, and animated by affectivity. The subject is a world bathed in meaning and emotion.

As the tension between the individual and collective mind intensifies, two vectors are significantly altered, time and space. The self, therefore, is in constant disequilibrium, openness, receptivity, and change, the dialogue between the self and the collective.

The model of "within" and "without" as a complement is practically the ontology for a real experience in virtual space formulated by Teilhard. He sees virtualization as the principal vector in the creation of reality. As the process of virtualization has been with us since the very beginning, it will affect physical presence, the collective world, the economy, politic, ethics, and technology. How will virtualization affect all these aspects? Changing time and space.

## Virtual Time and Space

Communication is essentially a virtual experience. A virtual experience has two basic components: time and space.

Teilhard believes that in virtual communication, time and space change considerably. As he says in his short work, *Man's Place in Nature* (1950):

> *I am also thinking of the insidious growth of those astonishing electronic computers which, pulsating with signals at the rate of hundreds of thousands a second, not only relieve our brains of tedious and exhausting work, but because they enhance the essential (and too little noted) factor of "speed of though", are also paving the way for a revolution in the sphere of research (p. 67).*

Teilhard simply understood that time itself can be measured by the advance of evolution, and the speed of time by the speed of evolution. Time can appear to go slower or faster, according to the lesser or greater number of events happening in its passage.

Teilhard argued in *The Phenomenon of Man* about the new concept of time and emphasized that "humans had lived in a narrow world, unaware of the dimensions of time and space. Moreover, these dimension have no relationship to each other. Now a new realization arose: time and space are organically joined again so as to weave together the stuff of the universe" (p. 218).

Teilhard had already realized that "evolutionary time can appear to speed up or accelerate. This is easily seen by two phenomena: the actual speeding up of evolution and

the great technological advancement in the recent era" (p. 120).

The passage from the mechanical[12] model to the virtual takes into account the following aspects:

- The plurality of times and spaces.
- In virtual time and space, there is no a uniform chronology, but a multitude of types of space and duration.
- Time is organized and invented according to the pertinent space where the different of life creates.
- The use of different modalities of transmission (oral traditions, writing, digital network) construct different rhythms, velocities.
- Each new mechanism adds a space-time. For example, a musical, a movie, an image, all can introduce different time according to the speed of images.

The change in time and space alters the physical, psychological and cultural vectors of relations.

## The Body in Virtual Time and Virtual Space

Prognostics for the future computers and internet indicate they will be operating at a high speed[13]. Alteration in time and space will affect the body and its relation to space.

Virtualization forces the body to adapt to a new time and space, redesigning its behavior, adapting to the new configuration of the new virtual space, accommodating the new environment of relations. A virtual relation with people in the internet alters the configuration of the traditional relationship.

The body can be viewed as the bridge for the relation between the external and the internal worlds[14]. The body as the communication medium plays a substantial role. The body is the medium. The body filters through emotions, the senses, sexuality, desire, and perceptions which succeed in the environment and consequently affects and is affected by the codes, languages, values, and technology of the environment. This model of the psyche may be applied to two people connected to the internet, talking to each other. The process of creating meaning - signification of the information - embraces all the physical and

psychological aspects of a person and his interaction with others in an environment.

The same process occurs between people and the means they choose by which to initiate contact. When using a personal computer, for example, a person may manipulate or destroy the text or image, organize the fragments of the text, or deposit it in another person's computer. The virtual begins to appear with the human subjectivity, with appeal for interpretations.

Levy understood the effect of the text in this new interpretation. saying that "the text serves as a vector, a substrate, or pretext, for the actualization of our own mental space" (p. 49).

The discussion among authors about the concept of space in cyberspace agrees that cyberspace is not only a physical space. This point is made by James Gleick (1994), who describes the Net as being in essence a non-physical entity: "It isn't a thing. It isn't an entity. It isn't an organization. No one owns it. No one runs it. It is simply everyone's computers, connected" (p. 57).

Cyberspace, therefore, cannot be viewed only as a material thing (computers, modems, telephone lines, etc.). According to Beniger (1996), it also has two major nonmaterial components: relationships among individuals,

and the cybercultural contents of their heads - the sense of belonging to cyberspace, and of what that might mean" (p. 51).

Cyberspace may be outlined in three levels as Rheingold (1993) suggests: "the conceptual space where words, human relationships, data, wealth, and power are manifested by people using CMC (computer-mediated-communications) technology" (p.5).

As a conceptual space for creating new meanings, cyberspace becomes a social organization and reproduction of sense, consciousness, and meaning among its members. In other words, a new space for creating a new identity among the members.

## Identity

It has been demonstrated that the change of time and space affect identity[15] on a personal and structural level.

Historically, the passage from print - based on a linear structure such as books (Eisenstein, 1979)- to virtually designed electronic graphics affected the definitions and constructions of self in our culture.

According to Bolter (1996), who has been studying the psychological aspects of virtual reality and self, Western

culture has been influenced by the technology of printing throughout several hundred years. According to him, two of the most influential constructions of self in the age of print has been the Cartesian ego. Descartes insists in the autonomy of the individual and a radical separation between subject and object. Descartes, and also Kant[16], said the visual and sensual aspects of human nature are subordinated to the faculty of reason.

As print emphasized and rewarded the individuality and uniqueness of the author, the arrival of fully electronic technology left behind the cartesian notion of self. "Now the new technology of representation is playing a role in the redefinition of self" (p. 111).

In *The Electronic Word*, Lahnam (1993) agrees with others that the computer disrupts and destabilizes linear text, but he points out that this destabilization has been a feature of the visual arts throughout the 20th century. Bolter maintains that "electronic technology is offering two distinct sets of tools for presentation and representation: tools for writing, and tools for visualization and sensory presentation. The computer and attendant technologies call forth both a new writing space and a new perceptual space" (p.112).

The continual growth of the use of computers and the internet has been altering human relations on both an individual and collective level. According to Strate, Jacobson and Gibson (1996), the process of adapting to virtual space (cyberspace), changes the way in which we communicate, both in format and in content. "Communication adjusted to meet the demands and biases of cyberspace is cybercommunication, and as communication and culture are intimately linked, culture itself is also altered" (p. 271).

Richard H. Cutler (1996) understands how this relationship between technology and the self provides the opportunity to enter into a new and different kind of relationship with others. Thus, computer media in cyberspace technologies allow the self to form virtual relationships, join virtual groups and organizations, and to build virtual communities without borders. This in turn alters the roles that people play and their very sense of identity.

Considering the interaction and the implications of building self-concept on line, Cutler maintained this interaction:

> *produces changes in two directions: toward self-concept building a group identity building. So, acting out roles or taking on expanded or new identities, participants become changed selves. They use the interactive, face-to-face nature of technology that*

*created the opportunity to further personal transformation and formation of groups"* (p. 327-328).

Lance Strate (1996), in his analyses of cyberspace and communication, considered time as a key element in the formation of cultures, communities, identities, and meanings. He introduces the idea of cybertime as an alternative, and as a complement to the concept of cyberspace. He argues that the computer functions as a clock - keeping, measuring, and producing time both for the outside world and through stories, games, and audiovisual presentation. "Cybertime is networked time and also a network of different concept of time" (p. 373).

According to Strate and Jacobson (1996), electronic communication calls into being electronic space. Computer-mediated communication (CMC) calls into being computer-mediated space. As products of communication, computers are creating new forms of social and cultural spaces. "We change the ways in which we communicate, both in format and in content. Communication adjusted to meet the demands and biases of cyberspace is cybercommunication, and as communication and culture are intimately linked, culture itself is also altered" (p. 271).

As the social relations are affected by time and space, the relation with institutions follows the same

parameters. The institutions, laws, and organizations, once virtually linked, offer ways to create new meanings, new signification. The relation between users and the institution virtually opens space for recreating new relations, new interpretations. The relation between an user and a state institution is interpretative, metaphorical.

Once interacting in the virtual environment, the concept of ethos is consequently altered by the process of dialectic. Teilhard nourished his ideas regarding this process of being in constant evolution and tension. New concepts are created, new signs are incorporated, new interpretations are made generating a new vision into the environment. A new ethos evolve from this virtual scenario.

## Virtual Ethos

Referring to a letter written in 1927 by Teilhard, Mooney relates ethos to beauty when he quotes Teilhard saying that what he desired to propagate was not a theory or system so much as a taste and perception of beauty (Mooney, 1976):

> *I try to translate the species of calm intoxication produced in me by an awareness of the profound substance of things into theories(how I wish I could*

> *translate them into music!), but these theories really matter to me only by their vibrations in a province of the soul which is not that of intellectualism. Those who do not hear the fundamental harmony of the Universe which I try to transcribe…look in what I write for some kind of narrowly logical system and are confused or angry…Once again, it would be more to my purpose to be a shadow of Wagner than a shadow of Darwin (p. 9).*

According to Christopher Mooney (1976), Teilhard used several ways when approaching ethical issues. Certain authors (Grau, for example) chose to center their reconstruction around Teilhard's analysis of love as a human phenomenon, and to underline its significance as the most unusual form of spiritualized human energy..

The ethos comes to him from the within, the force of evolution, the sense of others, the world, the beauty that is within humans. Teilhard referred, according to Grau, to the Great Presence in *The Phenomenon of Man* "a sense of the universe, a sense of the all, the nostalgia which seizes us when confronted by nature, beauty, music -these seem to be an expectation and awareness of a Great Presence" (p.266). However, Teilhard asks: "But, with this point made, how are we to explain the appearance all around of us of mounting repulsion and hatred?"

The relationship between love and aggression, as Grau (1976) notes, has been a perennial problem for ethicists

and has surfaced with considerable impact in the realm of psychology as well, to which the well-known split between Freud and Adler will attest. (p. 181).

Teilhard's notion of love also implies the concept of understanding the awareness of sharing in the struggle as itself as the important foundation for a universal human love.

> *As the same base for hope in the struggle have import for the second and third types of obstacles, with their peculiar facets of aggression. These obstacles exist in the ultimately more difficult sphere of human interpersonal relations and consist in what arises when men take aggressive action against each other, rather than against impersonal forces. The second type consists of persons or a person who gets in the way of what another person or group wants to do, and who are attacked for what could be described as motives of selfish, arrogant dominance. The third type, which can be classified as the unjust aggressor, is the sort against whom one can speak of action taken justifiable self-defense (p. 183).*

The tension between the two opposites, love and hatred, is positively determined as Provenzano (1993) realizes that "the positive tone to the Philosophy of Conscious Energy comes from the underlying assumption of him that the tendency toward organization and consciousness is more fundamental and, therefore, stronger than the opposite tendency" (p. 193).

Teilhard suggested that the repulsion is present in the "within," but

> *We should overcome the 'anti-personalist' complex which paralyses us, make up our minds, accept the possibility, indeed the reality, of some source of love and object of love at the summit of the world above our heads. Each one is responsible for the ethos. It is impossible to give oneself to anonymous number.*

Looking positively and realistically to the tension of two forces, love and hatred, Teilhard maintains an optimistic direction that humans may attempt to understand each other by their increasing level of consciousness and responsibility. He emphasized this idea in *The Phenomenon of Man:*

> *The most fundamental aspect of the universe is increasing consciousness. The highest level of consciousness that we have observed is the type of consciousness which is present in each and every individual human being". Therefore, each individual human being represents a localized maximum achievement of the universe's most fundamental tendency: a quantum of energy transformed to State of self-consciousness. The highest level of consciousness necessarily results in the highest level of free will - and the ability to exercise free will is liberty (p. 196).*

The ethos Teilhard brought from this perspective is consequently a decisive evolution of each individual that grows in the process of individualization and the sense of collectivity. Provenzano testifies that Teilhard "is so convinced of the value and uniqueness of each individual

person" (p. 170). However, the subjective ethos has its collective dimension as well.

There is an evolutionary process of self-understanding in which humans necessarily will find another side of being humans: collective-understanding or the sense of others. Teilhard believes that this process of collective-understanding comes when at the within of human beings they find a consciousness of their own consciousness, in being a person.

Murray ( 1996 ) argues that Teilhard's central thesis about the function of morality depends on man's awareness of his responsibility:

> *The progress, even the very survival, of modern science depends, moreover, upon man's success in responding creatively and morally to the pressure of socialization. No single man, no isolated group or professors, can acquire or master more than a tiny portion of scientific knowledge. Science is a collective possession, research a collective task. It depends not upon professional scientists alone but on a world-wide structure of government, industry, education, and communications (p. 135).*

The ethos also carries a social aspect. The sense of collectivity can elicit each individual to think about others and the consequences of his acts. Much like the cells form a group, the brain consists of millions of neurons, forming a body, humans create a network of interactions with physical, social, and psychological implications. Mooney (1968) interprets this idea:

> *The great body of mankind must be build up our of many cells which now lead their separate existences. Just as the human brain consists of millions of neurons which have been composed into a unity through innumerable connections and combinations and this make possible the unitary consciousness in man so must men combine with one another to form a kind of super-organism in which a communal consciousness, a suprapersonal unity would be manifested - with one difference: that the cells which constitute our brain no longer have an individual existence, whereas man, in virtue of his reflective consciousness, retains his individual freedom and separate existence, even within the larger organization (p. 100-101).*

The ethos of Teilhard is an attitude that comes from the consciousness of each individual that is in itself the sense of collectivity. The external laws and regulations must be up to this personal and social function. Teilhard's concept of collective community and its common interests are the base for a possible ethos. As Chardin states in *Human Energy:*

> *The powers that we have released could not possibly be absorbed by the narrow system of individual or national units which the architects of the human Earth have hitherto used. The age of nations has passed. Now unless we see to perish we must shake off our old prejudices and build the Earth.*

Ethos is more than a code of law or policy. It has to do with the sense of beauty, eros and spirituality.

## CHAPTER III - VIRTUAL MACHINES IN A VIRTUAL WORLD

*Teilhard's vision of Communication is comparable to a beautiful orchestra and symphony full of harmony and melody. Each note epitomizes an individual cell. Each instrument symbolizes a layer of the brain. Each musician represents an electronic machine and each piece of music portrays a network of thoughts and feelings. The musical presentation, the orchestra, and the public all combine to illustrate a convergence of signals transforms codes that generate into a backbone of intense energy. This, in turn, becomes a rapid transmission and reception of common feelings and the sense of beauty.*

*As individual notes form a song, cells form the net of neurons in the brain, the bits and bytes transmit a message digitally to the computer system and backbone extension, and codes and language transmit the meaning inside of a culture.*

*Virtual communication is a combination of different human and technical factors that mutually interact. In this sense, the future of virtualization is the digitalization of technology. This new digitalization enters the culture, and digitalization*

*eventually reaches humans. People are both virtual and digital. Likewise, so is the computer. This new virtual scenario confirms "electronic machine," the convergence of technologies, internet and cyberspace; digital culture is becoming part of the inevitable phenomenon of men.*

*The next section presents the accelerated process of virtualization as computer technologies increase.*

## The Evolution of Computers

The introduction of technology on earth, according to Teilhard Chardin, is part of human intelligence, a spiral of evolution, a necessity for social organization and surviving. He categorically affirmed in *The Phenomenon of Man* that "once life takes hold on a planet we can consider the emergence of technology as inevitable. The ability to expand the reaches of one's physical capabilities, not to mention mental facilities, though technology is clearly useful for survival" (p. 17).

Historically, human beings have developed this virtual process everywhere by creating art, culture, religion, economic relations, politics, technology. Virtualization is a condition of life. More recently, virtualization has

increased rapidly by the introduction of the computer in human lives.

In the second half of our century, three major changes revolutionized telecommunications. The first was the transistor, with the resulting expansion in semiconductor integrated circuits. The second was the development of solid state lasers. The third was the invention of the optical fiber, which replaced the electron with the proton as the carrier of information pulses.

The expansion of technology has greatly accelerated over time[17]. The continuous exponential growth of technology in the first two decades of the twentieth century matched that of the entire nineteenth century. The evolution of technology seeks to improve capabilities in an higher exponential.

The capacity of computers is increasing 100 times per decade[18]. Processing speeds, storage capacities and network bandwidths continue to evolve at a faster rate as well. Computers with increased processing memory and ability to deal with more of the physical world will evolve to handle more complex data types.

Gordon & James (1997) assert:

> *For five decades, progress in computer technology has driven the evolution of computers. Computers are everywhere: from mainframes to pacemakers, from the*

> *telephone network to carburetors. These technologies have enabled computers to supplement and often supplant other information processors, including humans*
> *(p. 6).*

The first computers only handled scalars and simple records. With time, they evolved to work with vectors, complex data bases, graphical objects for visualization, and time-varying signals to users, telecomputers, and television computers that are attached to phones and television sets. Computers have been growing exponentially in power, long before the invention of integrated circuits in 1958 or even the transistor in 1947. The speed and density of the World Wide Web, using the internet, has stimulated other computer classes to emerge, including network computers for corporate computation, the use of which doubled every three years.

According to Kurzweil (1999), computers are about one hundred million times more powerful for the same unit cost than they were a half century ago. Miggakizza (1996) observed that computers have significantly affected the history of people. "The advent of computers has overwhelmed and changed the way society functions. In this process, society has become more and more dependent on this

technology. Never before, in human history, has technology so captivated society in such a short period of time" (p. 102).

For five decades[19], progress in computer technology drove the evolution of computers. Computers are everywhere: from mainframes to pacemakers, from the telephone network to carburetors. In 1997, processor speed storage capacity and transmission rates were evolving at an arrival rate of 60%, doubling every eighteen months, beginning to understand speech. In the next few years, computers are predicted to deal with images, video, and provide virtual reality (VR) for synthesis (being in artificially created environments such as an atomic structure, building) and analysis (recognition). All this information will be networked, indexed, and accessible by almost anyone, anywhere, at any time - 24 hours a day, 365 days a year. A hierarchy of networks (Lans, WANs, POTS) connecting computer platforms that process, store, and interface with the cyberspace-user's environment in the physical world will be a possibility in cyberspace development.

In his introduction to the concept of UIC, Weiser (1996) gave a broad idea why computer will be everywhere.

> *The term ubiquitous is used because computers and computation will be everywhere, embedded in the fabric of our lives. Ubiquitous computing will bring the*

*internet into our daily lives with less effort. Instead of keeping lists of pertinent URLS or "favorite places" on our browsers, the devices that need the information can find it themselves. Instead of "surfing" to find and sift through all of the information available to us, some other agent or device will do the searching for us" (p. 1).*

Another important concept of Weiser's is the vision of Calm Technology[20], in which ubiquitous computing will implement calm technology; a world where computers do not cause stress, but enhance our lives and make many tasks easier

The internet has made networking useful and it is already becoming ubiquitous as telephones and television become "network"-ready. There is access to networked computers for use in the home, education, government, health care, and business worlds. The production and publication of literature, art and music, information, business, the exchange of data through e-mails and web sites is emerging quickly into the World Wide Web, creating more possibilities for communication. Access to more bandwidth and the convergence of technologies will create a new space and time for this new arena of communication.

Communicating over the internet is indeed revolutionary and - as did the railroad, telephone, radio, and television - brings with it the potential for much

change in how the world will perceive distance, time, space and global boundaries.

To Kurzweil (1999), "the telephone and the internet network, the two great networks of the twentieth century, will be joined by and merge with all the other electronic distribution system of the twentieth and twenty-first centuries" (p. 42). He argued:

> *The evolution of the computer from 1947 to the present is the basis of a model that will use to forecast computer technology and its uses in the next five decades. We believe that our quest is to get all knowledge and information into cyberspace, indeed, to build the ultimate computer that complements 'man' (p. 7).*

In these past years, there has been an increasing interest in computer technologies, psychology, and neuroscience, for the relation between men and machines. While there is an evolution of technology, there is also interest in making computers more physically, socially and psychologically adaptable to humans. The idea of changing from a tool to a medium has made computers more adaptable and closer to humans in the digital era. The new studies in Artificial Intelligence, virtual reality, neuroscience, media equation, and affective computing demonstrate the interest for making the relation between humans and machines much better.

Predicting the future of technology, Kerzweil (1999) predicted that the 21st century will be virtual in the first sense of the word.

> *It will dawn with the realization of the immense potential in laboratories, tapping the unexploited resources of semiconductor microelectronics and optoelectronics, and drawing on the power of human mind to devise the software and algorithms that will quicken the pace of the revolution in services and networks. Virtual, in the second sense, will characterize the services and networks of the future. A new, tangible reality will be fashioned for mankind, in which virtual sounds, pictures and sensations will simulate real presence. This seeming witch-craft will reach such heights that networks themselves and some service, virtually at present will appear perfectly independent of their physical substrates and quite intangible. Today's technology can fool the eye and ear. It creates the virtual, media-propagated environments which transcends space and time (p. 31).*

Especially in recent years, the process of virtualization has dramatically accelerated by the introduction of computers in the scenario of communication. Levy (1999), in his studies about collective intelligence and technology, attested "the speed and force of contemporary virtualization are so great that they exile beings and their attendant knowledge, alienate them from their identity, skills, and homeland" (p. 186). As the process of virtualization accelerates, the tension between personal, collective, and environment increases. The transition from mechanical time, space and vision to the

digital and virtual is sure to bring about unresolved conflicts and tensions, especially in the change of institutions, values, morals, education, religion and society.

The ultimate virtualization of life is becoming evident in many segments of our lifestyles. The virtualization of the economy is an example. The economic negotiations all over the world are changing the way in which consumers buy and transact. The entertainment industry is another example. The hundred of new channels that are available for the virtual is becoming part of the routine within many societies.

The introduction of technology on earth, according to Teilhard Chardin, is part of human intelligence, a spiral of evolution, a necessity for social organization and surviving. In the process of the evolution of machines, computers have become an extension of the human brain and a partner that connects and organizes the internal (self organization) and external worlds (society).

As the technology of computers increases, interest has grown in the brain/computer relationship. Recent studies have demonstrated this relation.

## Network of Neurons

During the past 10 years, there has been considerable interest in the studies of the human brain[21]. The World Federation of Neurology officially dubbed the 1990s "The Decade of the Brain." Cytowic (1996) states there are approximately 23,000 neurologists throughout the world studying the phenomenon of the brain "I recall that not too long ago only the most thoughtful, self-motivated, and philosophically-oriented practitioners pondered how mind emerges from brain. Today that question challenges bright individuals from several disciplines" (p.1).

As a biologist, Teilhard looked into the complexity of the nervous system[22], with its ability to store extensive memories and recognize visual, auditory, and tactile stimuli. He argued that the primary vehicle for increasing complexity consciousness among living organisms originated in the nervous system. The transformation and organization of small particles (cells, atoms, electrons) advanced from molecular combinations to more complicated ones. This process happens inside of cells, inside of the brain, and in human networks.

This same process can be expressed by the transmission of waves in radio (sound), the signals of television, the

bits and bytes in a computer transmission, and the electrons existing inside the wires transmitting data. For example, one piece of data can be sent from one computer to a network of computers connected to other networks through the internet. The network environments. A group of people working in different computers, sharing data and information.

Cytowic categorically maintained that "information is transferred through the nervous system in more ways than most people realize. Multiple communication channels exist in addition to what we know of as nerves, synapses, and the hard-wired circuitry familiar from classic neuro-anatomy" (p. 62). Cytowic argues the important relation between cortical layers and cells and the relation of them with the adjacent cortical column (p. 76).

To Teilhard the nervous system[23] is a neural network composed of billion of neurons. The communication system for humans follows the same structure.

A neural network is based upon the structure of the brain which consist of many billions cells called neurons. These build into a network and electrical signals can pass between neurons at a very fast speed by a conversion into chemical energy. Each neuron in the brain is equivalent to a single processing unit in the computer.

## Neural Network and Artificial Intelligence

Historical studies in Artificial Intelligence[24] demonstrate the mathematical base with which computers were invented. Warren McCulloch, after completing medical school at Yale, along with Walter Pitts, a mathematician, proposed a hypothesis to explain the fundamentals of how neural networks made the brain work. Based on many experiments with neurons, McCulloch and Pitts showed that neurons might be considered devices for processing binary numbers. An important foundation of mathematical logic, binary numbers (represented as 1 and 0 or true and false) were also the basis of the electronic computer. This link is the basis of computer-simulated neural networks, also known as Parallel Computing.

Teilhard dismissed the scientists at that time for limiting their focus to only the human body and felt they were lacking in their research by not paying attention to the power of mind. He notes in *The Phenomenon of Man* that "the time has come to realize that an interpretation of the universe - even as positivism one - remains unsatisfying unless it covers the interior as well as the exterior things" (p. 35). His whole vision of men is a constant alert: "The true physics is that which will, one day,

achieve the inclusion of man in his wholeness in a coherent picture of the world" (p. 36). He called attention to the complexity and meaning of the human brain and the physical and transcendent aspects of the mind. In order to explain his concept of the evolution of thought, he created the term "noosphere."

According to Teilhard, noosphere results from the combined action of two curvatures - "that roundness of the earth and the cosmic convergence of mind." The human brain has been developing because of its increased cranial capacity. The brain is a complex arrangement of cells and neurons forming a network of thoughts. As Teilhard says, the mind "gives a sense of spatial immensity, a sense of depth, a sense of number, a sense of proportion, a sense of quality, a sense of movement, and therefore, the mind illuminates our vision and organizes the world outside of us" (p. 34).

Research has shown that a signal received by a neuron travels through the dendrite region, and down the axon. Separating nerve cells is a gap called the synapse. In order for the signal to be transferred to the next neuron, the signal must be converted from electrical to chemical energy. The signal can then be received by the next neuron and processed.

In 1956, at the Dartmouth Conference, ten young researchers shared a dream of using a computer modeled in the ways that humans think. Their hypothesis was that the mechanisms of human thought could be precisely modeled and simulated on a digital computer. This was the foundation of Artificial Intelligence. With the use of "thinking" robots in agriculture, industry, NASA, and the military, the advance of AI has been astonishing.

Teilhard predicted the evolution of a machine that barely existed in his time beyond being a glorified abacus: the computer. John Mabry, in a recent article about Teilhard - "Cyberspace and the Dream of Teilhard" - states:

> *Teilhard's vision of what computers will achieve the completion of our brains, in that there would be the instantaneous retrieval of information around the globe. Second, computers will improve our brains by facilitating processes more quickly than our own resources can achieve them."*

Jennifer Cobb (1995) related the development of the internet to Teilhard's vision.

> *In the last half century, our models of the mind have become electrical and computational. Today, neuroscientists routinely talk about "feedback loops" and "brain circuitry". Instinctive behaviors are said to be "programmed" or "wired". We possess the "software" for certain kinds of mental activity. One study of Teilhard and Net found that Teilhard's complexity-consciousness law is the same as what we now think of as the neural net. We now know from neural-net technology that when there are more connections*

*between these connections, there will be sudden leaps in intelligence, where intelligence is defined as success rate in performing a task.*

The physical structure of computers is configured much like the human brain. To Teilhard, this natural model of configuration is the prototype for the creation of a global network of communication that we call the internet

## Convergence and Internet

In his writings about "Ubiquitous Internet Computing," Weiser (1996) affirms "the internet revolution has barely started. It won't be done until everything is on the Web. Light switches, pagers, copiers, printers, as well as PCs, benefit from Web connection" (p. 1 ).

Predicting a vehicle for carrying thoughts everywhere in the world, Teilhard tried to find an image for this "net." "Humankind is now caught up, as though in a train of gears, at the heart of a continually accelerating vortex of self-totalization."

Teilhard touched upon the notion that one must find a vehicle to move forward. As humans beings exist everywhere, it is already assumed that they are connected by a net of thoughts. But a 'net' is necessary for packing

the words, images, and sounds created by human minds. Cergg (1997) predicts the growth of the internet, saying that:

> *Until 2047, internet is everywhere. In seventy-four years it has grown from an idea to interconnect heterogeneous packet-communication networks to a world-wide, ubiquitous communication web joining people, businesses, institutions, appliances, and all forms of electronic equipment in a common communication framework. Like electrical power, it is assumed to be available whenever and wherever needed (p. 31).*

He adds:

> *The world's population will be about 11.5 billion by 2047, compared to about 5.8 billion in 1996. Internet will probably achieve penetration rates similar to television and telephony, at least in the parts of the world that have suitable power generation and other technology infrastructure (p. 38).*

The internet is growing every day. Vinton Cerf (1997), designer of the internet system, says that by the year 2000 there will be more than 100 million users. "This kind of reaching out from anywhere in the world," he says, "has got to change the way we think about the world. It will become critical for everyone to be connected. Anyone who isn't will essentially be isolated from the world" (p. 33). The possibility for new bandwidth, the speed internet will acquire, the new facilities and services on line, the wireless connected to the Internet, the World Wide Web, and the merging of cable, entertainment and television

companies will make the internet a place of convergence of knowledge. All these advances in technology will change our lives and affect us as individuals, spiritually, physically and pathologically.

Regarding international research, Teilhard believes that students, "are no longer distributed superficially and at random over the globe, but are functionally linked together in a vast organic system that will remain in the future indispensable to the life of community" (p.106). Cunningham (1997) interprets Teilhard vision of forty-six years ago as the coming of the internet.

Consciousness happens in the third phase, according to Chardin. He views it as the moment at which the world is covered with the incandescent glow of consciousness.

Cobb sees in the development of the internet the realization of the third phase of evolution. "Teilhard saw the Net coming more than half century before it arrived" (p. 2).

## Cyberspace

The word Cyberspace was used for the first time in 1984 by the science-fiction writer William Gibson in his novel *Neuromancer* (1986) to describe an electronic

environment in which data and programs can be seen and manipulated as if they had physical attributes - shape, color, motion. It represents the transformation of communications technology from a connection between locations into a location of its own. People are able to plug themselves into cyberspace, and move around and interact with the data "objects". As a concept developed by Gibson and other writers, cyberspace is a "virtual reality" that is full of images, some of which exist nowhere else but in electronic form and some of which are symbolic representations of the physical world. Cyberspace[25] is both real and imaginary - partly a type of collective dream, partly a place where people encounter experiences that yield serious and permanent consequences in all dimensions of their existence.

Studying the relation between Teilhard Chardin and the internet, Kreisberg (1995) notes that Teilhard predicts the use of the prefix "cyber" in regard to the computer-human matrix, since "cyber" is commonly used in computing cycles.

The promise of the use of cyberspace as a new vehicle for transmitting and receiving knowledge is increasing as technology improves. Bell & Gray (1997) believe that

"Cyberspace will provide the basis for wonderful new ways to inform, entertain, and educate people" (p. 5).

Heim also views cyberspace as "more than a breakthrough in electronic media or in computer interface design. With its virtual environments and simulated worlds, cyberspace is a metaphysical laboratory, a tool for examining our very sense of reality" (p. 82).

Seduced by the aesthetics fascination of cyberspace, Heim sees cyberspace as in William Gibson's vision, as more erotic than sensuous, more spiritual than utilitarian. He is convinced that "the computer's allure is more than utilitarian or aesthetic, it is erotic." The cyberspace "fascinates not only our eyes and minds, but also our hearts. We feel augmented and empowered. Our hearts beat in the machines. This is Eros".(p. 87). Taking the Cyberspace entities as belonging to a broad cultural phenomenon of this period of computer technologies, he argues Cyber Eros has its roots in Plato philosophy[26]. "Platonic metaphysics helps clarify the link between Eros and computerized entities" (p. 87).

Another aspect of Cyberspace is that it supplants physical space, gathers people more closely together, avoids isolationism, and offers an unrestricted freedom of expression and proximity.

On the other hand, according to Heim, today's computer communication does present disadvantages when we communicate in cyberspace.

In this paradoxical context that cyberspace offers, how can one make cyberspace an experience of real communication? There are two ideas which support a real communication. One is that of community and physicality, the other is that of shared values. These ideas help to provide the basis of many network observers' sense of "cyberspace".

The concept of interpretive community, which can be traced in part to Stanley Fise (1989), focuses less on physical location than on values and culture. It is not one's neighborhood but rather one's way of seeing the world that identifies and defines interpretive communities. Although members of an interpretive community may share some physical spaces for a period of time, an interpretive community, says Joseph Harris, "refers not so much to specific physical groupings of people as to a kind of loose dispersed network of individuals who share certain habits of mind." (p. 105)

This sense of community has been demonstrated by those interested in the values of specific groupings of professionals. Thomas Kuhn's (1970) notion of scientific

communities is based, for example, on the idea of its members sharing common values and cultural norms. In the political arena as well, the idea of community is one rooted in its members' sense of values and purpose (Lacalu, 1991).

How could we civilize cyberspace? Is it possible to create public policies that shape it to serve our needs? How will the information superhighway change our social, educational, and political connections? What will the social spaces and rhetorical forums of the future look like?

In Teilhard's investigation there are important aspects he considers as the base for this cyber community: the sense of individuality that is accomplished in meeting others; the sense of collectivity present in each individual; the energy of love that provides a strong desire for communicating and the spiritual aspect of knowledge to be shared with others; and lastly, machines as the extension of humans.

In writing *The Revolution Yet to Happen*, Bell & Gray (1997) predict the amount and type of information in cyberspace. "We believe that our quest is to get all knowledge and information into cyberspace, indeed, to build the ultimate computer that complements 'man'" (p. 7).

By 2047, predict Gordon and James (1997), we will be residents of many "virtual villages and cities in the cyberspace sprawl defined by geography, demographics and intellectual interests" (p. 10).

The cyber in Teilhard's vision is the way humans will overcome the geographic space of communication and will be the alternative for traveling this distance faster.

## Virtual Education

The access to computers and the internet has tremendously affected the method and the content of education. The youngest generations of people growing up in the culture of digital media have already began to absorb virtual education. The quick and inexpensive access to information has affected the traditional space of education.

As Gordon & James (1998) predict: "we will become symbiotic with our networked computers for home, education, government, health care, and work, just as the industrial revolution was symbiotic with the steam engine and latter with electricity and fossil fuels" (p. 10).

Teilhard insists that knowledge is part of the nature and mission of human beings. This knowledge, however, must

be transmitted to others. Knowledge is fruit of human work. It is power.

In *The Phenomenon of Man* Teilhard affirmed that "knowledge for its own sake. But also, and perhaps still more, knowledge for power. Increased power for increased action. But finally, and above all, increased action for increased being" (p. 249).

Teilhard emphasized the sharing of knowledge through machines. The newest technologies are already offering great opportunities for access to virtual libraries, museums, universities, sites of government and particular institutions which actually may be a new revolution in education[27]. Bill Gates (1999) believes making technologies a central part of the educational experience to connect entire communities with school, including museums, libraries and governments offices will create a new way of teaching and learning will be enhanced.

Restructuring the traditional educational system by incorporating new technologies will change education. Thornburg (1991) believes the future of education will depend on restructuring education in a way that adapts to the new technology revolution that is already taking place in business.

The new virtual schools and universities in different part of the world are facilitating the exchange of knowledge at a cheaper and faster rate. The experience in virtual reality and education is an important key for helping students to experience environments they most likely would never be able to visit in a geographical sense.. For example, a student in USA may travel virtually to Greece to see the pyramids.

Machines will break barriers of language. Multiple languages are a barrier to communication, and much of the world's population is illiterate. Video and music, including gestures are, however, universal languages easily understood by all. Thus, the coupling of images, music and video with computer translation of speech may become a new, universal form of communication. The possibilities are endless when one begins to realize that an entire way of life could drastically change as more technology is applied into everyday existence.

## Physical and Cognitive Emotions

In recent years new studies in the areas of psychology and neuroscience have arrived at a certain consensus that physical and cognitive emotions are related

to each other. A whole vision of emotions will facilitate a more affective relation with computers and advance toward the possibility of computers becoming "emotional" in the future.

Picard (1997), in her book *Affective Computing,* considers the cognitive and physical aspects of emotions on humans for developing computers that would be able to recognize and express emotions:

> *Today we know that both brain and body interact in the generation of emotion and its experience. Not only can thoughts lead to emotions, but emotions can occur without obvious cognitive evaluations. The view points on the relative importance of the physical or cognitive components today depend largely on how "cognitive" and "physical" are defined* (p. 22).

Teilhard (1967) had complex insights regarding how emotions and aspirations are essential for humans. "We have followed, in the individual, the gradual assumption of the emotions, aspirations, and actions in an indefinable sui generis, which is all these things at once and something more as well" (p. 38).

Constituted by a physical characteristic, humans have sensibility and emotions. Teilhard does not define precisely the psychological aspects of humans, but offers a large panorama for the emotional elements of human beings. Teilhard considers the potential of human body as the

medium for communication with the external world. Evidently, he did not develop a systematic theory of emotions, but considered the complexity of the human body and its senses in its role in communication.

Chris and Parker (1997) consider the functions of the senses in this interaction:

> *We experience the real world through the operation of sight, touch, smell, audition and taste, all of which convey information to the brain. The senses are complex systems, but in order to operate their need be operated by external energies such as light or sound. "This information is transformed into a form usable by the brain and provides information regarding the form and content of the external world and of the perceiver's position within this world. In normal sensory perception the various senses work together in providing a stable to use sensory information to guide actions and make decisions (p. 53).*

Several studies in emotions[28] have shown how important a role emotions play in human intelligence, rational decision making, social interaction, perception, memory, learning, creativity and more. Picard suggests in her studies about emotions that it is time to examine how emotions can be incorporated into models of intelligence, and particularly into computers and their interactions with humans.

Recently there has been a preponderance of evidence that emotions play a pivotal role in functions considered essential to intelligence.

The recent studies in Intelligence approaches present the concept of Multiple Intelligence (Gardner, 1983) in which human intelligence takes multiple forms, including social intelligence, which includes interpersonal relations. The traditional notion that emotions and rationality Emotions theorists have also argued the role of emotion as a powerful motivator in intrapersonal skills.

Studying emotional intelligence, Salovey and Mayer (1990) identify the importance of emotional intelligence, which they define as "the ability to monitor one's own and others feelings and emotions, to discriminate among them and to use this information to guide one's thinking and actions" (p.123).

Others psychologists studying emotions, such as Goleman (1995), maintain that emotional abilities are more important than the traditional psychometric model of intelligence. This new understanding about the role of emotion in humans indicates a need to rethink the role of emotion in computing.

Neuroscience has increased the knowledge of the brain mechanisms, hormones, and neurotransmitters. Developmental

psychologists have added information on developmental changes in emotions and their role in attachment and temperament, and the ways in which the development of emotions and cognition are interrelated. Clinical psychologists have found relations among psychological disorders and types of emotion experiences and examined ways of applying the new knowledge of emotions in psychotherapy (Izard, 1977).

If Teilhard truly considered the computer as the extension of humans, then he suggested that computers need to be able to relate to people more adequately. Affective Computing may be a new step for this symbiosis.

## Affective Computing

According to Picard, if we want computers to be genuinely intelligent and to interact naturally with us, we must give computers the ability to recognize, understand, even to have and express emotions.

Teilhard recognized new dimensions in the human mind which must be explored in order to develop all its physical and psychological potential. He mentioned briefly the new dimensions that takes place in human mind. If the machine is the extension of humans, computers, therefore, must be

able to interact with humans on a certain level. If the relation between the network of neurons is equivalent to the network of humans and machines, men have to create computers that have abilities to respond emotionally to humans. If computers are the destiny of humankind, they must have more than pieces of hardware. They must become human-like.

Picard proposed that computers should be adaptive to people. In other words, computers and humans must form a natural symbiosis. Teilhard insisted on the necessity to personalize what is a product of human invention. In his concept of convergence, the union of different entities (everything that has energy) - "whether it be the cells of a body - the member of a society or the elements of a spiritual synthesis, in every organized whole, the parts perfect themselves and fulfill themselves" (p. 262).

The searching for a center - "the confluent of orbits of their centers" - is a necessity for the formation of the whole. The computer system, such a confluence of hardware and software - animated by energy of bits and bytes, convergence the energy forming a confluence of small particles, generating unity. Such an organism searching for identity, the computer has an evolutionary physical and spiritual structure that look for unity together.

Teilhard (1959) considered the virtual elements of reality (either internal or external structures) as a process of unification.

> *Under the influence of these two factors - the essential immiscibility of conciousness, and the natural mechanism of all unification - the only fashion in which we could correctly express the final state of a world undergoing physical concentration would be as a system whose unity coincides with a paroxism of harmonized complexity* (p.262).

Toward the process of virtualization, the "physical" and "spiritual" aspects of human nature and the products of human creation must form a symbiose. In this context, Affective Computing is a necessity for humans and computers to feel a part of each other. Experimenting[29] with software that recognizes humans speech, Automatic Speech Recognition (ASR)[30], a group of researchers started a wide range of projects in pattern recognition, machine learning, neural networks, computer-chip design, supercomputer design, recognition, and novel human-machine interfaces.

Olive (1997) in his studies considered, for example, that to write a computer opera it would be necessary to deal with the intriguing subject of computer emotions. Other research, conducted by Kurzeil (1997), suggests that our computer systems must be capable of understanding the variability of human speech. Studying computers and

language, Schank (1997) suggests that program computers should be able to generate and understand sentences. Other studies conducted by Reeves & Nass (1996) about computer and social behavior demonstrates that computer users can perceive computer as possessing personality and being social and polite. Rosenfeld (1997) suggests that in the near future "computers should be able to reliably recognize a wide variety of objects and actions, including their user's faces (and voices), facial expressions, body postures, and gestures."

To Teilhard the noosphere is a "planetary thinking network," an interlinked system of consciousness and information. Compared with the evolution of the cerebral cortex in humans, the evolution of designing computers must follow the structure of the human brain, with its net of neurons, the cognitive and emotional complexity of the cervical and limbic areas of the brain, as the neurological studies of the brain demonstrates. If "electronic machines" are the extension of human brain and spirituality, Teilhard believes that in the future computers will be able to understand and respond to a certain extent of human emotions and spirituality.

Teilhard's vision has been developed as we enter into the new century. Humans now have a direction: walk toward a virtual world.

## CHAPTER IV - TOWARD A VIRTUAL WORLD

*This last century has become technologically revolutionized in these few modes of communication: the transistor, radio, television, computer, and the internet. The passage from one era to another, with all the social, cultural and ethical changes, is part of the natural process of evolution. Current technology is continuing to evolve in the area of digital computing.*

*Digital computing, based on "bits" of information which are either off or on - zero or one, has created the virtualization of text, sounds, pictures, and moving images. The many advances in communication technologies, such as computers, the World Wide Web, wireless, internet, artificial intelligence, and virtual reality have confirmed that the digital revolution has already taken place.*

*However, there still exist challenges and problems regarding technology and humans that need to be confronted as we enter into the Age of Information. Some of the challenges include: living a world from cybercorps, electronic commerce, virtual reality, electronic media, and multimedia to cyberpolitics and cyberlaw.*

## The Conflict Between Real and Virtual in Technology

Social scientists have in recent years devoted much attention to new information and communication technologies. Yet there has not been a consensus within the various approaches involved on how to explain the role of communications media, human-computer interfaces, or scientific and technological advances in general.

In recent years the dominant approach has been centered around "the sociology of scientific knowledge," which rejects the realism or the notion "that there is a world to be investigated which exists independently of human belief and language. According to Schroeder (1996) this thought is mainly shared by social constructivism, deconstruction, or postmodernism. (p. 2-15).

By denying the real experience through the media, this assumption denies that knowledge is separated from the reality to which it refers. As a consequence, neither the genesis or the effects of new technologies can be explained.

More importantly, without realism, the progress of technology and science cannot be considered immersed in the culture. Technology is imposed by ideology, and therefore, the product of this interaction is superficial and unreal.

It creates a dualism between people, technology, politics, economics, and what they produce. Unfortunately, if this dualism exists, its is impossible to build a foundation which would allow, for example, computers to be used more extensively in education.

While there is the consideration that these technologies supposedly make our social world less real, they initiate much thinking about the blurring of boundaries between nature and culture, between humans and nonhumans. These latest incarnations of post-modern antirealist ideas come to be known as "cyberculture" and its favorite adjective is "virtual." Heim analyzed this point made by Escobar saying that we are "concerned with virtual reality, therefore, we need to look at these postmodern ideas as part and parcel of the range of cultural phenomena that have sprung up around this technology" (p. 4)

The discussion between the relation between technology is presented in the thought of the existentialist philosopher, Martin Heidgger, who developed a middle position. He considers technology as a part of human existence, even though that technology may be used for power and ideology. Heim (1993) addresses Heidgger as the

philosopher who accepted technology as the inevitable part of human existence.

## The Computer as a Simple Tool

According to some authors[31], computers have been developed mainly in paradigms of logic and rationality, emphasizing too strongly the rationalism and formality of computers. Norman (1997), who studied the relationship between humans and computers, concludes that the computer is a tool constructed in a linear, logical, and formal manner. That has created a separation between people and machine.

Sometimes the technology has been deliberately constructed to produce mechanical systems that operate reliably, algorithmically, and consistently. They are based upon mathematics (in the case of the first computing devices) and logic (in the case of the more modern devices).

Consequently, computers have not yet been considered fully integrated into people's daily lives.

Norman expresses this gap:

> *Researchers trying to create intelligent computers have focused on problem solving, reasoning, learning, perception, language and other cognitive tasks*

> *considered essential to intelligence. In the 1960s, workers in the fields of cognitive psychology and artificial intelligence ignored emotions and social interaction and focused exclusively on sheer intellect: reasoning, remembering, problem solving, decision making and thought. The parts of human intelligence we thought would be easy to stimulate - seeing, hearing, walking, moving, turned out to be incredibly difficult. We have barely begun to study the social and emotional aspects of artificial intelligence* (p. 264).

The decision of expanding the use of computers for educational means is not one that can be made lightly. Drawing on neuropsychological research and an analysis of current education practices, Healy (1999) demonstrated that the use of computers may compromise the children's ability to concentrate and to absorb and analyze information.

## The Internet

Many issues surround the computer-mediated public sphere which currently exists through the internet. The internet evolved as a network of computers in public institutions which allowed cooperative research between universities, hospitals and government research establishments. The internet has in recent years become the space for business, relationships, individual and collective spaces. Psychological[32], policy [33]and ethical[34] questions have been raised, illuminating many concerns.

According to the psychologist Wallace (1999), the Web is heavily spiced with "role-plays," deceptions, half-truths and exaggerations, perhaps making it a risky business when people come to develop relationship on the internet.

Studies of addiction have shown that psychiatric illnesses such as depression, are often associated with internet addiction as well. Young & Rodgers (1998) suggest that low self-esteem, poor motivation, fear of rejection, and the need for approval associated with depressives contribute to increased internet use.

Many have identified the reality and identity construction that is said to occur in both networked virtual worlds on the Internet and in multi-sensory virtual reality as an "altered state of consciousness' that produces heightened awareness and transcendence (Benedikt, 1993; Stenger, 1993; Rushkoff, 1994).

The notion that virtual reality potentially induces an altered state of consciousness and a sense of disembodiment begins with Gibson's fictitious 'cyberspace' as a space of 'consensual hallucination'(1984). Theorists consistently refer to this 'spaceless place' (Nixon, 1992) to describe the way humans interact within global networks.

Communication in cyberspace is quickly raising numerous intellectual property[35] issues, among them significant challenges to the traditional notions of copyright. Furthermore, the promise of intense communication in cyberspace raises questions regarding the importance of personal privacy, the security of institutions, and the credibility of transactions.

Research conducted by Lessard & Baldwin (2000) showed that the physical and psychological problems such as stress, isolation, discrimination and exploration already exist inside the internet jobs. "There is a very good reason why people don't like to talk about how rough it is to really work in the internet business. There is enough misery among the workers who are building tomorrow's digital economy" (p. 4).

Since we are creators, producers and users at the same time, the net becomes a very powerful medium, completely different from radio and television. In this new arena of "communication democracy," the balance between individual rights and collective interest may become an issue.

## Policy Issues

Given its decentralized character and ever-growing expansion, attempts to list or 'map' the internet's interconnected computer sites have been difficult at best. The internet has been a model for still-fictional and idealized notions of cyberspace - described as a new and unregulated 'frontier'. The virtual free-space is raising important issues regarding freedom and regulation.

Policy issues such as electronic commerce, cyber-crime, cyberporn and censorship, customized news delivery, online democracy, and security and freedom concerns need to be addressed as we evolve into the new world of internet.

Analyzing the cultural aspects of the internet as a virtual place and culture (net-culture), Rob Shields (1996) sees in the internet a challenging policy issue for three factors: privacy, copyright and regulation. "Internet has been called the first true 'cyberspace.'" With this, it has raised questions concerning the nature of social interaction. Cyberspaces such as the internet offer, according to Shields, "temporary autonomous zone where illegitimate contents and forms of communication may flow unrestricted (for example the widespread dissemination of

child pornography via downloaded computer-image files)" (p. 1).

The internet is changing the way people deal with institutions and laws. Shapiro (1999) argues that a radical change is beginning - not just in how we compute or communicate, rather, it is a potentially radical shift in who is in control of information, experience and resources. He shows how new technology is allowing individuals to take power from large institutions such as government, corporations and the media. Powerful entities are resisting this change and limiting our new digitally-enhanced autonomy.

There has been a challenge for establishing a balance of power for the digital age (between self-interest and public interest; the market and government; personal control and shared power). Without this balance, our relationships on the internet may become vulnerable, generating insecurity and fear.

## International Challenges

In a broad look at the development of the internet, technical problems such as lack of network development, economic investment, social and economic problems are

visible. Many nations all over the world are still not prepared to enter into the scenario of the Age of Information. Frieden (1996) writes that many nations still have fewer than 10 telephones per 100 habitants. However unbelievable, some people are still waiting for a telephone line.

The major difference between the rich and poor countries has widened an isolation gap for billions of people. The relation between poverty, ideology, and expansionism is still a challenge for the convergent world.

The ideological aspects of media, interest groups, the manipulation of power-media, and the psychological aspects of advertising still create difficulties for the expansion of the internet.

The concept of convergence also has technological, regulatory and business implications. Some governments in particular countries still have the monopoly of regulation[36] and a resistance to technological innovations. The development of a global scenario for convergent technologies hits economic, social, educational and geographical challenges. For instance, building the new architecture of telecommunication resources, access to bandwidth, networks will demand potential investment. It will take much time and patience to transfer data, voice,

and video information into the Information Age, as well as confronting governmental and private competitions, laws and disputes.

## CHAPTER V - A NEW SCENARIO OF TECHNOLOGY AND VIRTUALIZATION

*The information technology has had a social, psychological, and cultural impact. Earlier in his career, Teilhard envisioned the world elevating toward more and more technology and he passionately brought forth the idea of virtual communication. He did not ignore or try to bypass the problems and challenges he knew it would bring to humankind.*

*His " global-village vision" was formulated in a virtual dialectic, characterized by the tension in the nature of humans who longed for the sense of wholeness on one hand, and yet on the other hand, the temptation for dualism existed. This gigantic conflict had practical consequences which were either physical or psychological, perhaps economical or ethical, or cosmic or scientific.*

Teilhard's contribution to this new scenario of technology and virtualization may be defined as follows:

### The Vision of the Virtual as the Potential of the Real

As already presented, the relation between the concept of real and virtual is still generating dichotomy in different disciplines related to technology.

According to Teilhard, knowledge is not separate from the reality to which it refers. The genesis of technology is based on the real-virtual as a complement. Then science, technology, and society may coexist and complement each other. The relation between technology and society, a dynamic one, will produce advances in the "reality" of the social settings in which they have become embedded.

Taking the virtual aspects of the elements cited, his contribution relates especially to the following points:

- The use of the body as a medium for interaction in network environments.
- The cognitive and physical aspects of emotion considered as components of each other.
- The computer software integrating codes and symbols of the cultures
- The relation between people and computer technologies as physically and psychologically integrated.

## The Convergence of Technologies

Convergence is the law of communication. The brain carries inside convergence of cells, neurons, that generate thoughts that are thrown into the universe, much like a group of computers forming a network. The millions of

antennas, parabolic dishes, magnetic fields, satellites, backbones, networks, cellular phones, and the internet follow the same design as human brains: a network of energy, a convergence of thoughts that create language, ideas, knowledge, and the sensory experience of human energy.

According to Teilhard, as biological evolution proceeds, it will produce increased variety and higher degrees of organization. It also produces more varied, more intense, and more highly organized mental activity or awareness.

By developing the personal level of consciousness, humans will be led to new types and higher degrees of organization. On the one hand, there are new patterns of cooperation among individuals - cooperation for practical control, for enjoyment, for education and notability in the last centuries, for obtaining new knowledge. On the other hand there are new patterns of thought, new organizations of awareness and its products.

Convergence will result from the following steps taking place:

- The development of the internet will link human beings around the globe, and through the internet humans will gain access to the virtual education, health,

business, and universities. Many groups will be unable to offer opportunities to transmit and share knowledge among different people in a worldwide setting.

- The building of a planetary democracy of communication and solidarity among people.
- The exchange of telecommunication networks, systems and services that enable people geographically present on the five continents to develop systems (either metal or optical network cables - as well as wireless and satellite communication systems).
- The use of electronic machines as a channel to transmit knowledge.
- The multiple effort of different nations combining their research capabilities to enhance mutual progress.
- The appreciation of different cultures, languages and people.
- The awareness of being both an individual and of a collective group - an ultimate sense of humanity among people.
- To be able to access radio, television, journals, the internet, universities and schools in different parts of the world.

## A Human Basis for Technology

The human body for Teilhard is a medium in and of itself. The complexity of cells, the nervous system, glands, emotions, the senses, eros - perception must be integrated with electronic machines to help humans to experience the world outside in the best possible harmony.

Computers are becoming more physically and psychologically in contact with people. A person can now wear a computer in their belt. They are getting closer to their muscular tension, heart rate, temperature, and so on. Many people already have more physical contact with computers than they do with other people.

Considering the whole aspect of communication in Teilhard, the relation with computer technologies must be healthy for humans. If technology is an extension of humans, it must an attempt to fulfill humans on some level. The symbiosis of men and machine must be one that forms and completes. The human basis for the improvement of the relation between people and computers may fit in the following aspects:

- The use of the body and senses for virtual reality and other related technologies.

- The use of virtual reality technologies and affective computing to help people with stress, depression, anxiety, addicted, etc.
- The merging of the biological with microelectronic discoveries.
- The development of Nanotechnology - a body of technology in which products and other objects are created through the manipulation of atoms and molecules.
- The development of Quantum Computing based on qu-bits, which are essentially zero and one at the same time.

## Virtual Aesthetics

Moving from the mechanical concept of computers to a more virtual concept will eventually allow humans to explore the aesthetic aspect of reality.

The genesis of the Teilhard's aesthetic originated in his concept of "within" as beauty. He confirmed it by saying "from all the points of nature, the forces of bodies converge, to become interiorized and sublimated in beauty and truth" (p. 63).

The beauty that appears externally has its roots internally. It is such an interior energy that follows virtually the law of everything in nature.

The aesthetics result from self-consciousness and the use of technology for the development of arts. The recent development in computer design confirms these aesthetics principles:

- Exploring the aesthetic dimensions of art in multimedia design
- Exploring the 3D image in art design
- Utilizing multimedia(sound, image) and animation
- Designing better interfaces for computers
- Making computers smarter and more affective

## Virtual Mind and Machine

Teilhard was a visionary of the future. To him the future of technology meant to extend what one we can do with the body, the senses, and the mind. The future, interpreted by Teilhard, involves the association of the progress of science related to these three factors.

He became profoundly enchanted with the power of the mind and machine; he imagined that one day technological progress would eventually create a computer that would

represent the configuration and the potential of the layers of the brain.

He understood men as are mutants and dynamics, by following the law of the universe - that is considered progressive. The evolution of technology has been a continuation of the evolutionary process of acceleration of the mind of human beings' aspirations.

The vision of evolution in Teilhard offers possibilities for exploring the marvelous and incredible power of the human brain, cells, DNA, light, and energy associated with technologies that have been taking place in different areas of computer technology.

- Machines will eventually have human thoughts, emotions and consciousness.
- The development of Affective Computing that recognizes and expresses emotions.
- The 100 billion neurons of the human brain will contribute to developing technology that follows the model of human brain.
- The studies of human genetics associated with the development of technologies
- The development of optical computing using stream of photons (particle of light) rather than electrons.

- The development of molecular computing, applying actual DNA to practical computing applications.
- The traditional printed book can be replaced by electronic books.
- The traditional school and library can be transformed virtually.

## Virtual Spirituality

The concept of spirituality[37] in Teilhard is related to the technological progress of humankind and is essentially ecumenical and universal. Through the technological development, humans enable themselves to develop unification, centration and spiritualization. These aspects are related to science and technology.[38]

Spiritualization has to do with the sense of improving self-consciousness. To him "life is entering into a new era of autonomous control and self-orientation. As a direct result of his socialization, man is beginning, with rational design, to take over the biological motive forces which determine growths - in other words, he is becoming capable of modifying, or even of creating, his own self" (p. 181).

To Teilhard, the development of mental and spiritual dimensions reside in the force of the "within." This force is present in each individual. For his ecumenical and universal concept of God, Teilhard offers a base for a "spirituality for the cyberspace."

His virtual concept of spirituality as evolution and destination of humanity may be categorized by the following points:

- By intensifying the relationship among people communicating on the internet, the growth that emerges will bring about a sense of collectivity.
- Developing relation with the collectivity favors the sense of self-consciousness. (individuality).
- Improving technological endeavor contributes to the progress of humankind
- Using the potentialities of human abilities (physical, artistic, spiritual, moral) will enable the contemplation of the divine.
- Investing in research and studies will contribute to the wealth of the world.

## Conclusion

In order to live real experience in virtual network environments, considering the whole aspects of the

relation between humans and computers, Teilhard's vision of virtualization as part of the real experience is fundamental for the new scenario technology is providing to human beings.

The development of technology responds to the evolution of the human brain. Virtual taken as a potential of the real determines a new relation of time and space that is secure and necessary for creating a convergent world that offers more social, cultural, and economic possibilities for those who are connected to cyberspace.

The development of virtual network environments that offer access to virtual culture, economy, education, entertainment and places will create a "global village." The development of a fundamentally virtual society is part of the finality of progress and technology. For this endeavor, Teilhard's vision offers a human, aesthetic, and ethical basis for technology that is urgent and necessary as we enter into the world of virtual ecomony, education, arts, entertainment and relationships.

Further multidisciplinary studies related to the experience of real in virtual network environments will contribute to the enrichment of this important area of study and research.

[1]. For the comparison between the concept of Darwin and Teilhard regarding evolution see, for example, Birx (1990). He deliberately focuses on the life, thought, and lasting influence of both Darwin and Teilhard de Chardin, their contrasting interpretations of evolution, stress, materialism, and spiritualism, respectively.
[2]. Several authors have interpreted the complex meaning of the terms created and linked by Teilhard. See Klauder (1971:133-150).
[3]. Overviews of this debate in relation to the concept of Complexity may be found in Jacques Rosseau, in Aristotle. McCarty (1976: 110-111).
[4].The terms radial and tangential are introduced in *The Phenomenon of Man* (1940). See PM pp. 53-66; chap. 3. "The Within of Things", esp. pp. 63-66; "Spiritual Energy" pp. 168-169; "Human Energy" pp. 115-116.
[5]. In Teilhard, energy has a vast extent and varied application of meaning. It can refer not only to physical phenomena, but can be used analogously with an applied meaning to the realm of spirit.
[6]. Overview of this debate in relation to the collective mind is presented in Levy's *Collective Intelligence* (1997). Levy gives a philosophical base for the discussion of Collective Intelligence.
[7]. There is a large amount of literature on the discussion of the relationship between humans and machines. A philosophical discussion may be found in Heim(1993). He develops the concept of Heidgger and Technology. For a technical and commercial discussion humans-computers, Norman (1998) offers a good base. For a physical and psychological discussion user-computers, Picard (1997) offers an overview from the concept of emotions until the possibility of computers "having" emotions.
[8]. Mark Lajoie in his article "Psychoanalysis and Cyberspace" - in "Cultures of Internet" chapter 10, edited by Rob Shields(1996) London: Sage Publications offers detailed aspects of sexuality and cyberspace.
[9]. In Teilhard, consciousness has a much wider connotation than in traditional thought. It includes "radial force" (energy) or "psychism" in inert matter. Simple consciousness of perception in animals. Reflective consciousness in man (de Lubac).
[10]. According to Umberto Eco the fascination with the networked virtual reality is much like the fascination with hyper-real worlds such as Disney.
[11]. The concept of spiritual in Teilhard may be found in Klauder (1971: 29-125)
[12]. Jay David Bolter (1996), chapter 7, pp 105-119 offers an overview difference between printed graphics and electronic graphics.
[13]. The high-speed in internet is predicted by Vinton, G. Cert (1997:34-42) "When They are Everywhere" in *Beyond Calculation* edited by Peter J. Denning, Robert Metcalfe (1997) New York: Copernicus. In his perspective the internet will probably achieve penetration rates similar to television and telephony, at least in the parts of the world that have suitable power generation and other technology infrastructure.
[14]. See in Popper (1994: 1-23) arguments about knowledge: objective and subjective, relation body-mind and its discussions.
[15]. Heather Bromberg in his article "Are MUDs Communities" Identity, Belonging and Consciousness in Virtual Worlds" in " Cultures of Internet" - Virtual Spaces, Real Histories, Living Bodies edited by Rob Shields( 1996 ) London: Sage Publications offers an excellent panorama virtual space related to psychological and cultural aspects of virtuality.

[16]. Especially Martin Heidgger and those influenced by him, such as Derrida, and through the Frankfurt School and those in its tradition such Habermas discusses the objective and subjective interpretation - hermeneutics of this relation in modern culture.
[17]. 25 years of Computer history may be found at http://www.compros.com/timeline.html
[18]. For a comprehensive overview on the future of computer capacity, see: Hans Moravec, Mind Children: The Future of Robot and Human Intelligence ( Cambridge, MA: Harvard University Press, 1988). Also The Age of Intelligence Machines ( Cambridge, MA: MIT Press, 1990), 401-419.
[19]. Weiser & Brown(1997:76-85) divide the age of computing into three eras. In the first, the era of the mainframe, computers were few and expensive. In the second, the era of the personal computer. In the third, the coming era of the ubiquitous computers.
[20]. For the notion of Calm Technology, see Weiser (1997: 76-85). He suggests that distributed computing is not yet adapted to our lives. Ubiquitous computing, characterized by deeply embedding computation in the world, will require a new approach to fitting technology to our lives.
[21]. The brain has been studied in different perspectives. See (Pinker, 1997) "How the Mind Works" and Deacon, 1997, "The Simbolic Species."
[22]. For an overview of the Neural Network, ftp://ftp.sas.com/pub/neural/FAQ.html. This web site has numerous resources on past and current research on neural nets.
[23]. A comprehensive explanation the construction of nervous system in the context of noosphere in Teilhard, see *The Phenomenon of Man* (1959:180-189).
[24]. An excellent exposition of the historical and theoretical aspects of Artificial Intelligence may be found in http"//tqd.advanced.org/2705/applications.html and http://www.geocities.com/Research Triangle?Lab/8751/what.html.
[25]. For an overview of Cyberspace applications from cybercorps, electronic commerce, virtual reality, electronic media, and multimedia to cyberpolitics and cyberlaw, in "Cyberwords" see T. L. Kunii & A. Luciani (Eds.) (1998) Tokyo: Springer
[26]. Herbert Zettl (1996) "Back to Plato's Cave: Virtual Reality", pp. 83-103 develops the concept of virtual using the example of the cave by Plato in "Republic".
[27]. There are vast studies about Virtual Reality and Education. A good site is in http://eastnet.educ.ecu.edu/vr/vrits/2-4cox.htm.
[28]. A wide vision of different approaches about emotions may be found in the studies made by Izar (1991). The Social psychologists approaches on the influence of emotions on social interactions and relationships. Cognitive and social-cognitive psychologists that emphasizes the increased our knowledge of the cognitive determinants of emotions and emotion as cognition relations. The Personality psychologists that have begun to analyze traits in terms of discrete emotions. Clinical Psychologists have found relations among psychological disorders and types of emotion experiences and examined ways of applying the new knowledge of emotions in psychotherapy.
[29]. Recently, a group of researchers started a wide range of projects (pattern recognition, machine learning, neural networks, computer-chip design, supercomputer design, image compression, expert systems, handwriting recognition, document analysis, uses of global networks

such as the World Wide Web, novel human-machine interfaces) that opened new studies about emotions and computers, Picard(1997) argues about the Affective Computing trying to proof computer may "have" emotions. Studying computer music and linguistic information in computers, Olive ( 1997 ) considers that to write a computer opera is necessary to deal with the intriguing subject of computer emotion.

[30]. In "The Age of Spiritual Machines"(1999:101-260) Kurzweil offers an excellent overview of how the integration technology body and brain may generate a physic and spiritual relation using the potential of technology and the structure of human brain.
[31] . Weiser, "Beyond Calculation", McCullogh (1996) and Norman (1997) offers an overview about the matter.
[32]. Recent study reports a substantial correspondence between internet use and depression. In a two-year longitudinal study Kraut, Patterson, Lundmark, Kiesler, and Scherlis present data that indicate that increased internet use causes increased depression. Studies of addiction have shown that pscychiatric illnesses, such as depression, are associated with alcoholism and drug addiction, as well as Internet addiction(Young &Rodgers, 1998)
[33]. Attorney General Janet Reno recently vowed to catch the cybervandals. The FCC needs to face new challenges in the net area. Cybercrime on the internet has become an important issue in policy. Also in computer industry, there is the concern of how to protect the boom of the e-commerce and the privacy of the users. Business Week, February 21, 2000, :CyberCrime" p. 37-42.
[34]. The recent attacks to the important sites in USA by Hijacking has raised questions about the vulnerability of the internet, how to protect the sites, how to control such attacks. See Newsweek, February 21, 2000,p. 39-49.
[35]. Laura Gurak (1997) gives a general view in concerning security in Cyberspace such structures of online communication, gender in cyberspace, communities of the virtual future.
[36].Rob Frieden (1996) *International Telecommunications Handbook* gives an overview of technology development, Law, Policy related to regulation and deregulation in different nations in the world.
[37]. The theological aspects of spirituality in Teilhard is developed by Klauder J. Francis *Aspects pf the Thought of Teilhard de Chardin.* He compares, for instance, the relation between Teilhard theology and St. Thomas Aquinas and the Franciscan School.
[38]. Discussion about Science and Faith is explored in Teilhard's vision by James Birx (1967) in *Interpreting Evolution on Darwin and T. Chardin,* p. 179-263.

# BIBLIOGRAPHY

## BIBLIOGRAPHY


Barron, I., & Curnow R.(1979). *The Future with Microelectronics*. New York: Frances Printer LTD.

Baudrillard, J. (1998). *The Ecstasy of Communication*. Translated by B. Schutze and C. Schutze. New York: Semiotext.

Beardon, C., & Dane, W. (1993). *Computers and Society*. London: Intellect Books.

Bell, D.(1979). "The Social Framework of the Information Society." In Michael Dertouzos and Joel Moses (Eds.), *The Computer Age: A Twenty-Year View*. (pp. 163-211). Cambridge, MA: MIT Press.

Benedikt, M. (1991). *Cyberspace: First Steps*. Cambridge, MA: MIT Press.

Benedikt, M. (1993). "Cyberspace: Some Proposals," in M. Benedikt (ed.), *Cyberspace: First Steps*. Cambridge, MA: MIT Press.

Besser, A. (1994), *A Novel of Virtual Reality*. Berkley, California: University of California Press.

Biocca, F., & Levy, R. M., (1995). *Communication in the Age of Virtual Reality*. Hillsdale, New Jersey: Lawrence Erlbaum Associates, Publishers.

Birx, H. J.(1991). *Interpreting Evolution, Darwin & Teilhard de Chardin*. Buffalo, New York: Prometheus Books.

Carr, K. & England, R., (1995). *Simulated and Virtual Realities. Elements of Perception*. London: Tayler & Francis.

Cert, V., in *Beyond Calculation*, chapter 2, pp. 33-42.

Chartrand, R. L. (1991). *Critical Issues on The Information Age*. Oxford: Pergamon Press, Inc.

Clive, D.(1999). *I Know How You Feel*. New Scientists. London, May 8.

Cuenot, Claude (1967). *Science and Faith in Teilhard de Chardin*. London: Garnstone Press.

Cunningham, P. J. (1997). *Teilhard de Chardin and the Noosphere*. http://www.december.com/cmc/mag/1997/mar/cunning.html

Cytowic, R. E. (1996). *The Neurological Side of Neuropsychology*. Cambridge, MA: MIT Press. (New York: A Grosset/Putnam Book.).

Deacon, T. W. (1997). *The Symbolic Species. The Co-evolution of Language and the Brain*. New York, London: W. W. Norton & Company.

Denning, P. J., & Metcalfe, R. M. (1997), *Beyond Calculation. The Next Fifty Years of Computing*. New York: Copernicus.

Ermann, D. , Williams, M. B., & Claudio, G., (1996). *Computers, Ethics and Society*.

Einstein, A. (1954). *Relativity, the Special and the General Theory: A Popular Exposition* (rev. ed. R. W. Lawson, Trans.) London: Methuen.

Forester, T., & Morrison P., (1994). *Computer Ethics*. London, England: The MIT Press.

Foster D., & Meech F. J., (1995). "Social Dimensions of Virtual Reality" (p.209-214). In *Simulated and Virtual Realities* (pp. 209-214). London: Taylor &Francis.

Frieden, R., (1996). *International Telecommunications Handbook*. Boston, London: Artech House, Inc.

Gardner, H. (1982). *Art, Mind and Brain: A Cognitive Approach to Creativity*. USA: Basic Books.

Gates, B. (1999). *The Speed of Thought: Using a Digital Nervous System*. New York: Warner Books.

Gibson, W. (1986). *Neuromancer*. London:Grafton.

Griffin, E. (1997). *Communication Theory*. New York: McGraw-Hill.

Gurak, J. L. (1997). *Persuasion and Privacy in Cyberspace.* New Haven and London: Yale University Press.

Grau, J. A. (1976). *Morality and the Human Future in the Thought of Teilhard de Chardin.* Cranbury, New Jersey: Associated University Presses, Inc.

Haraway, D. (1992.) "The Promises of Monsters: A Regenerative Politics for Inappropriated Others." In Lawerence Grossberg, Cary Nelson, and Paula Treichler (Eds.), *Cultural Studies* pp. 295-337. London: Routledge .

Harris, J (1989). *The Idea of Community in the Study of Writing.* College Composition and Communication 40(1): 11-12.

McLuhan, H. (1962). *The Gutenberg Galaxy: The Making of Typographic Man.* Toronto: University of Toronto Press.

Healy, J. M. (1990). *Endangered Minds.* New York: Simon & Schuster

Heim, M. (1993). *The Metaphysics of Virtual Reality.* New York, Oxford: Oxford University Press.

Izard, C. E. (1977). *Human Emotions.* New York: Plenum.

Izard, C. E (1991). *The Psychology of Emotions.* New York and London: Plenum Press.

Kay, A. (1990). "User Interface: A Personal View." In B. Laurel, (Ed.), The Art of Human-Computer Interface Design (pp. 191-207). Reading, MA: Addison Wesley.

K. Ray. (1999). *The Age of Spiritual Machines.* New York: Viking.

Keating, M., & Keating, H. R. F., (1969), *Understand Pierre Teilhard de Chardin: A Guide to The Phenomena of Man.* London: Lutterworth Press.

Keeps, C. J. (1993). *Knocking on Heaven's Door*: Leibbniz, Baudraillard and virtual reality. Ejournal 3, n. p. Available July, 1998 via anonymous ftp: EJOUNAL@albany,bitnet.

Klauder, F. J., (1971). *Aspects of the Thought of tThe Teilhard de Chardin.* North Quincy, Massachusetts: The Christopher Publishing House.

Kobayashi, K. (1984). "Man-Machine Interaction in 'C&C' Age." In *1 Human-Computer Interaction* (p. 1-11). Salvendry, G., Editor. Amsterdam, Elsevier.

Kreisberg, J. C. (1995). *A Globe, Clothing Itself with a Brain.* June, 1999 article in http://www2.gol.com/users/coynerhm/teilhard.html

Kuhn, Thomas S. (1970). *The Structure of Scientific Revolutions.* Chicago: University of Chicago Press.

Kunii, L. T., & Luciani, A., (1998). *Cyberwords.* Tokyo: Springer.

Laclau, Ernesto (1991). "Community and Its Paradoxes: Richard Rorty's 'Liberal Utopia.'" In *Community at Loose Ends,* edited by the Miami Theory Collective. Minneapolis: University of Minesota Press.

Latour, B. (1993). *We Have Never Been Modern.* Hemel Hempstead: Havester Wheatsheaf.

LeDoux, J. E. (1996). *The Emotional Brain.* New York

Lee, P. (1995). *The Democratization of Communication.* Wales: University of Wales Press

Lessard, B., & Baldwin S., (2000) *Net Slaves: True Tales of Working the Web.* New York: McGraw- Hill

Levy, P. (1998). *Becoming Virtual: Reality in the Digital Age.* New York: Plenum Trade.

Levy, P. (1997). *Collective Intelligence. Mankind's Emerging World in Cyberspace.* New York and London: Plenum Trade.

Loeffler, C. E., & Anderson, T., (1994). *The Virtual Reality Casebook.* New York: Van Nostrand Reinhold.

Mabry, J. R., (1994). *Cyberspace and the Dream of Teilhard de Chardin.* July, 1999 article in http://members.home.net/dlature/united/ph2paper/noosph.html

MacKinnon, R. C. (1995). "The Social Construction of Rape in Cyberspace." In F. Sudweeks, S. Rafaeli & M. McLaughlin (eds.) *Network and Netplay: Virtual Groups on the Internet.*

McCarty, D. (1976). *Teilhard de Chardin.* Waco, Texas: Word Books.

Mark, W. (1995). "Auditory Virtual Environments." In *Simulated and Virtual Realities, Elements of Perception.* (pp. 179-185).

McCullough, M. (1998). *Abstracting Craft: The Practiced Digital Hand.* Cambridge, MA: MIT Press.

McCullough, M. (1965). *Embodiments of Mind.* Cambridge, MA: MIT Press.

McLuhan, M. (1962). The Gutenberg Galaxy. Toronto, Canada: University of Toronto Press.

Miggakizza, J. (1996). *Social and Ethical Effects of the Computer Revolution.* Jefferson, NC: McFarland & Company, Inc. Publishers.

Miller, S. E. (1996). *Civilizing Cyberspace: Policy, Power and The Information Superhighway.* New York: ACM Press.

Moser, A. M., Macleod, D., (1996). *Immersed in Technology.* Cambridge: The MIT Press.

Nass (1996). *The Media Equation.* Cambridge: University Press.

Nixon, N. (1992). "Cyberpunk: preparing the ground for revolution or keeping the boys satisfied," Science-Fiction Studies, 19: 219-35.

Norman, A. D. (1999). *The Invisible Computer.* Cambridge: The MIT Press.

Norman, A. D. (1988). *The Psychology of Everyday Things.* New York: Basic Books.

O'Malley, C. (1998). *Computers that Read your Face.* Popular Science. New York, November.

Parsons, P. R., and Frieden, R. M., (1998). *The Cable and Satellite Television Industries.* Needham Heights, MA: Allyn and Bacon.

Picard R (1997). *Affective Computing*. Cambridge: The MIT Press.

Pierre, T. C. (1965). *The Phenomenon of Man*. New York: Harper & Row.

Pierre, T. C. (1973). *Toward the Future*. New York, London: A Helen and Kurt Wolff Book.

Pierre, T. C. (1964). *The Future of Man*. New York: Harper & Row.

Pierre, T. C. (1967). *On Love & Happiness*. San Francisco: Harper & Row.

Popper R. K., & Eccles, J. C., (1977). *The Self and Its Brain*. London, New York: Springer International

Popper, K. R. (1994). *Knowledge and the Body-Mind Problem*. London, New York: M. A. Notturno.

Rheingold, H. (1995). *Virtual Reality*. New York: Touchstone.

Rushkoff, D. (1994). *Cyberia: Life in the Trenches of Hyperspace*. San Francisco: Harper

Salvendy, G. (1984). *1 Human-Computer Interaction*. Amsterdam: Elsevier.

Schroeder, R. (1996). *Possible Worlds. The Social Dynamic of Virtual Reality Technology*. Colorado: Westview Press.

Shapiro, A. L. (1999). *The Control Revolution*. New York: A Century Foundation Book

Shields, R. (1996.) *Cultures of Internet, Virtual Spaces, Real Histories, Living Bodies*. London: SAGE Publications.

Solomon, H. (1999). "MIT Students Work on Sensitive Computing Devices." *Computing Canada*. Willowdale, Nov. 19. Vol. 25, Issue 44.

Springer, C. (1996.) *Electronic Eros*. Austin, Texas: University of Texas Press

Stenger, N. (1993). "Mind is a Leaking rainbow," in M. Benedikt (ed.), *Cyberspace: First Steps*. Cambridge, MA: MIT Press.

Steven, P. (1997.) *How the Mind Works*. New York, London: W. W. Norton & Company.

Stone, A. R. (1995.) *The War of Desire and Technology at the Close of the Mechanical Age*. London, England: The MIT Press.

Stork, D. G., ed. (1997) *HAL's Legacy. 2001's Computer as Dream and Reality*. London: The MIT Press.

Thornburg, D. D. (1991). *Edutrends 2010. Restructuring, Technology, and the Future of Education*. USA: Starsong Publications.

Vince, J., *Essential Virtual Reality*. UK: Springer.

Wallace, P. (1999). *The Psychology of the Internet*. Cambridge: Cambridge University Press.

Wark, M. (1994) *Virtual Geography, Living with Global Media Events*. Bloomington, Indianapolis, IN: Indiana University Press.

Wells, B. B. (1997). *The Computers Revolution*. Commarch, New York: Nova Science Publication, Inc.

Weiser, M. (1991). *The Computer for the 21st Century*. December, 1999 article in http://www.ubiq.com/hypertext/weiser/SciAmDraft3.html

Wiggins, R. W. (1994). *The Internet for Everyone: A Guide for User and Providers*. New York: McGraw-Hill, Inc.

Wolfe, T. (1999). *Digibabble Fairy Dust at the Human Anthill*. Forbes-ASAP-October 4, pages 213-226.

Zizek, S. (1997). *The Plague of Fantasies*. London: Verso.