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The Network Metaphor & the New Renaissance

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Abstract
This article is about art and science and a certain parallelism between them in the evolution of Western culture, particularly over the last 150 years. I will try to describe what changes have taken place in our society's operational schema and our shared paradigm. My construct will be one of art, though a strong influence from science will be evident. I propose that we have been living through a second renaissance provoked by a profound change in the definition and representation of reality by both art and science. Throughout the 20th century, the ideas put forth by both have been extremely unconventional and the two have interacted in ways not always obvious, providing new metaphors, new patterns for defining the future shape of our culture.

Keywords: network, renaissance, interactivity, art and science

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The Origin of Art and Science: The Need to Know

In contemporary society culture for most people, institutions and governments is understood as art or art institutions, museums, galleries, all the various entities of the art world. Most forget that culture, in its final definition, is the sum of knowledge of a society and that things other than art form an integral part of it, notably science. Webster's dictionary defines culture as

"the integrated pattern of human knowledge, belief and behavior that depends on man's capacity for learning and transmitting knowledge to succeeding generations."

To exclude the world view of science from culture is as myopic as eliminating the artistic vision from knowledge.

Western bureaucracies have put science in a special role of its own which has certainly underlined its importance but has also separated it from culture and from art. Art and science form over the years the base of what we understand of the world, how we experience it. They are our two complementary tools for knowing what we know. The one is an individualistic and highly subjective attempt to understand the environment and man's place in it, while the other is a supposedly objective and communal effort to do the same. Art can be considered as moving from concept (the world-view of the artist) to analysis (the individual work of art) and science from analysis (the collected data of the scientific community) to concept (the peer-approved explanation of phenomena). In the definition of culture given above, one of the key words is 'pattern'. Art and science together provide a pattern which ultimately represents the world-view of a society or culture.

To better understand the relationship between the two, and their involvement with culture, is to recognize that the fundamental goal of both is to construct models of reality – the organization of perceived elements into logical patterns. The need to build

1 Marcel Duchamp, Duchamp du Signe – Ecrits Paris 1975, 173. (author's translation)

such patterns can be considered as the underlying psychological impulse in the first artistic gestures of mankind, be it song or movement in imitation of nature, privileging found objects as keys to the environment, painting the body to tune to imagined universal energies. This is as true today though the artist may be relating to an environment beyond that of nature by adding to it the man-made environment evolved over millennia, culture. All these acts are motivated by a certain concept of reality, a sense of what is out there and of how we should relate to it. The need to create reality or realities – all of which are representations and therefore virtual – from environmental stimuli is fundamental to mankind. It is a form of knowing and art and science in their most primitive forms codified and transmitted it from generation to generation.

The need to understand – the need to know – is a very basic necessity in the human being, to arrive at an instant interpretation of sensory information in order to know, to act and to better survive. Knowing is survival and survival is knowing. Long before Homo Sapiens, pre-hominids were confronted by diverse images, sounds and smells and had to decide on whether they constituted a danger or not. The senses evolved to provide that information. The need to understand the surrounding environment was and is essential to surviving in it. The result is that we can receive sensory information objectively for only a very brief instant in time. What we sense is immediately interpreted and a mental image is drawn from that information providing the basis for action. That mass of objective information serves no function at all if it is not interpreted and conclusions drawn from it. Perception means interpretation and the need to create an instant image of reality is part of the mechanism of perception. We experience this daily as we make sense of new stimuli for which we do not have an automatic response. When the sense data change significantly, new pictures have to be formed, new conclusions drawn and often new actions invented. Perception is cognition and cognition is the basis of action.

This process is fundamentally the same as building models, constructing some limited form or expression of reality from received givens, making mental pictures from what is perceived by projecting patterns on those givens. We interpret to survive, the need to know is fundamental to life and an expression of it. The same impulse is behind the more elevated and sophisticated drive to understand the universe by building models of it. At the level of the individual artist the urge to create derives directly from that primitive need to know and art is intimately tied to survival. We begin with primitive man's need to understand his immediate surroundings in order to survive to the larger arena of making sense out of the universe. We project patterns onto nature to better understand it.

The same drive linked art to religion when the reality reflected in art was that proposed by religion. The two were synonymous for most of the history of humanity and art was nothing more than the visual or aural manifestation of religion. The other, newer, builder of realities, science, shares the need to understand our surroundings by deducting a form of reality from things observed. In earlier civilizations science was not separated from either art or religion and only broke away when differences in definition became impossible to ignore. The only way to understand the conflict between Galileo and the Catholic Church is to realize that the struggle was over the principal of who would define the universe. That privilege had been the reserve of religion up until that time. Since roughly the 17th century, our society has ceded that right to science as a way of knowing more objectively by applying reason and logic to what is observed.

In parallel, art expanded our reality to include more than the actions of gods and divine-right kings. Science, by taking over the definition of material reality, what we might actually call the representation of the material world, freed the artist from the need to do so and allowed him to explore other aspects of the human condition. This has been particularly true since the 19th century and is fundamental to the understanding of 20th century art. Those artistic realities have been highly subjective and very different from society's governing world-view, increasing the difficulty of communication between artists and the community and often obscuring the message. Still, seeing the need to construct realities from either a physical, metaphysical or spiritual point of view provides a common objective putting into perspective what is fundamental to mankind. When the lay-person understands that most of the

art of the century has been a series of experiments in model-building, the ensemble becomes less hermetic and one begins to understand the lessons of art and the directions proposed without the histrionics that have often accompanied it.

Models as Visual Space

If we accept the parallel between art and science as two sources of knowing, looking at them as an ensemble provides us with information that can be complementary. The models of reality proposed are from radically different approaches. Science builds concepts from observed facts and artists work from personal concepts to create artifacts. Science strives to create a model of reality that is all encompassing and objectively arrived at and, eventually, socially acceptable in the sense that society agrees with the proposition and accepts the model as real. Art is quite different in that the reality expressed is uniquely that of the artist, and in it one hopes to see something universal. The role of art is to construct individual models of reality, the artist's reality, and the symbolic language for communicating it. Each work is like a fragment of a broken holographic plate. Each shard of the plate contains the whole object – the world-view of the artist. Each piece is distinct in itself but each contains the entire image and not a fragment of it. That image/object is the artist and his vision, filtering, funneling, concentrating what he has pulled from the world around him – a personal mythology or ideology. In contrast, science appears more monolithic than art and the scientist more anonymous than the artist. In reality, both must be regarded as an ensemble in order to understand where the search for understanding is taking us and what kind of model is represented by that combined whole.

We can understand this process by imagining the world-view of a society as a visual space, a space in which we see how things work. All of us carry such a vision in our heads which is a product of our culture and, in that sense, the visual space is a shared space. We understand the world – and by extension the universe – to be operating in a particular fashion and know how we fit into it. This can be a very primitive image, one based on numerous different sources of so-called knowledge. It can be the mythology of early man formed into what we can recognize as a religion. It can be based on scientific information that is later proved to be false. Exchanging and accepting as correct those pictures, those conclusions, is another way of defining culture.

Just as individuals need to make sense out of perceptual information in order to act and survive, by communication they exchange concepts allowing them to live together. Each society constantly recreates itself through communication by continually redefining its collective reality, its culture, its shared space. The sum of our different communication possibilities, word-of-mouth, newspapers, radio, television, cinema, and now the net, all of the ways we receive and transmit information, form a space in which we see ourselves reflected. It is from that space that we learn how to act toward others, where new members learn what society proposes, where the unspoken rules of society are demonstrated. The fact that today that space is dominated by the media is basically a 20th century phenomenon which has its good and bad sides. These are issues which we do not have to address here. What is important in the context of this article is the visual space, which is very real and central to society is a fundamental expression of how our society operates. What recreates that space is important to how we continue to function, particularly at a time when so much change surrounds us.

Another way of understanding the space is to consider it as a paradigm, a set of rules governing how things work. It is thus an organizational space as well. We construct the visual space, the visual expression of the paradigm, as a way of comprehending the world around us. By pretending to understand how it works we develop responses to the model in our own individual or collective actions. We act according to how we think things work. That visual, cultural, organizational space becomes a philosophical and psychological space, a virtual representation of what we know and how we act.

When society changes profoundly one of the obvious manifestations of that change is a new visual space, a new paradigm. When religion was the means used to define the universe it was normal that art was intimately related to religion. It was the ideology that provided the context for the artist, his psychological and philosophical base for interpreting sensory information. The motivation of art and religion was the same, building a visual space giving meaning to the chaotic mass of information received

and provide society with an operational base. This was also true for science and in certain societies that form of investigation was obliged to reinforce the existing world-view of the dominant ideology rather then set out on its own. But science explains how things work, not why. Culture supplies the 'why' and when society pretends the contrary, it usually means that science has been misappropriated.

When Western civilization accepted science as the exclusive means of defining the material universe it was natural that it influenced art to a tremendous degree. This is true, first in the simple sense of the Duchamp quote, as a source of new metaphors, but also in the fact that many of the artistic discoveries of our century paralleled those of science, space-time, interactivity, observer created reality… Art engaged itself with this material universe asking the questions about what it means to us and how do we fit into it. Since science was dealing exclusively with the 'how', much of that artistic production was attempting to go beyond, looking for the 'why'. Science may define the world but art transmits a feeling for it, and a sense of how we might fit into it, going well beyond science in often intangible ways. In a society which ceded to science the right to define its reality, the material definition of reality is often all that is asked for. In that case, much of what art proposes can seem mysterious, puzzling and put-offish, yet intriguing and attractive, because of the series of 'whys' it may suggest.

The Role of Art

Art is an attempt to understand something of the human condition from the subjective world-view of the artist and through it provide new perceptions. The collection of those world-views is commonly called culture. We have already discussed the fact that culture contains more than the point of view of artists, but that is what I would like to look at now.

The artist reveals the evolution of the psychological environment of his era, often anticipating the changes coming in society. This has been ever more so, since we allowed art to be the personal expression of the artist speaking from his inner self. The psychological climate of a place or a time is a very real fact of society and one observable by others as well as the artist, but of particular concern to the artist because it is his domain. The physicist Werner Heisenberg described it:

> "The spirit of a time is probably a fact as objective as any fact in natural science, and this spirit brings out certain features of the world which are even independent of time and are in this sense eternal. The artist tries by his work to make these features understandable […] The two processes, that of science and that of art, are not very different. Both science and art form in the course of the centuries a human language by which we can speak about the more remote parts of reality."[2]

This again can be called exploring and building the visual space, the continued remodeling of humanity's imaginary space according to how fundamental human values are expressed in a particular period.

The role of the artist, as the scientist, is thus that of a researcher. At least it has become so in the 20th century. The artist is a kind of social researcher applying his creative intuition to the condition of man in order to discover, as another scientific great of our century Niels Bohr described it, "the relations between the manifold aspects of our experience".[3] Through his work he comments and critiques, judges and debates, evaluates the human condition – the analysis of man in his environment from the interior of the individual creator.

Art and Communication

The movement from the art of the individual to the culture of a group is a subtle one, and not easily discernible. Art is the work of one human being, isolated from society though in some fashion reflecting it, a highly personal creation from a singular world-view. Culture is collective, at best, the ensemble of world-views merged into one, a kind of social contract evolved from the accumulated, filtered knowledge from the past. How in fact does the world-view of the artist become culture? The artist's work must first identify something of that "spirit of a time" referred to by Heisenberg[4]. The spectator responds to something he understands as important even if only intuitionally, something in which he can find himself. When enough of those single observers respond in a similar fashion, through communica-

[2] Werner Heisenberg, Physics and Philosophy, New York 1958, 109.

[3] Niels Bohr, Atomic Theory and the Description of Nature, New York 1978 (Reprint Cambridge University Press Edition 1934), 18.

[4] Heisenberg, Physics and Philosophy (see note 2), 109.

tion, a critical mass is reached and the work subsumed in the reality of the collective. This is consistent with the definition of reality of another physicist John Wheeler, a student of Niels Bohr, that "reality is the joint product of those who communicate",[5] a view very much influenced by the Copenhagen School of Quantum Physics, established by Niels Bohr, and its emphasis on the important role of the observer. Art is communication and thus an important part of that "joint product", communication from the individual to the collective and the collective as the sum of individuals. That sum of realities is culture. Art remains a one-to-one experience. Culture is the thing I enter into and the tool I use to do so. That tautology actually explains the dynamic participation, more open in our era, of the individual in the evolution of culture. We are a product of our culture, but by entering it with our own altered version of what that culture expresses, we change it.

A second and closely related part of the dynamic in the movement from art to culture is the role of the artist as educator of perception, Marshall McLuhan's definition. A person relating to the new propositions of a work of art, is in fact going through a change of perception, learning to see differently through the differing set of relations proposed by the artist. This is particularly true in regards to new definitions, systems, functions or technologies that will eventually have an impact on our lives that may not be immediately apparent. In this light, the subject of a work of art is less important than the organizational propositions behind it. In the painting of Masaccio, what was important in the long run was not the content of the work, but the fact that men had acquired individual identities in a new space with a different set of relations between them and the social and political environment they inhabited. This was the beginning of the Renaissance space and these features were a radical departure from the representations and therefore the spirit of the Middle Ages. The artist was representing a new set of relations which were becoming manifest in 15th century Italy. That rationalized materialist space, both artistic and scientific, with its clearly distinguished individuals, represented the humanism of the time and its value system and it has stayed with us as our own visual and operating space well into the 20th century. Renaissance perspective with the addition of time, as in cinema, is still the imaginary space of the majority of people in our society today. We will see that that model no longer describes adequately what we are now experiencing.

Today's art represents as radical a break with the past as the art of the 15th century did between the Middle Ages and the Renaissance. New definitions of the human being and his relation to others and his environment are implicit in the work being done and are often made possible by the arrival of new technological processes. New tools are often the means by which artists can better express the things they sense and the vehicle by which the new ideas are introduced to society and culture transformed.

From the beginning of the artistic revolution of our times, artists have been anticipating the new space we are trying to define. Cezanne, in his still lifes, broke with the perspective of the Renaissance with its imposed single point of view by proposing several different points of view within a single image through multiple angles of view.

Marcel Duchamp proposed this same idea in 1913 in a simple manner with his work, *Trois stoppages-étalon*. The work consisted of dropping a one-meter thread from a height of one meter and tracing the line formed to create a new 'standard meter'. By creating three of them, he suggested that there were several points of view, as did Cezanne, several ways of measuring and that each of us carries within his own standard meter. The subjectivity of perception furnishes each individual with his own form of measurement and the communication of these different points of view defines reality in the sense that Wheeler has proposed, of social convention. Marcel Duchamp seemed to be anticipating or moving parallel with the scientific paradigm changes in almost everything he did. He dealt intimately with art as process more directly than many other artists. Art is process, first in the act of creation and then in the act of appreciation. The spectator, observer, forms part of the indispensable chain that is art. Duchamp regarded a work of art as having two poles, the artist and the spectator, each equally important. Both participate in the definition of a work. This is very close to our definition of the interface between and

[5] John Wheeler, Center for Theoretical Physics, University of Texas at Austin, in: Johns Hopkins Magazine, XXXVII. 1985, No. 5, 24.

individual and his culture and it also finds a strong parallel to the role of the observer in the Copenhagen School of Quantum Physics.

Duchamp also anticipated the shattering effects of the Theory of Relativity. At the same time Einstein was dealing with space-time magnitudes, using a moving train to demonstrate changing bodies of reference, Duchamp was painting *Jeune Homme Triste dans un Train*, the movement of a person within a moving train. Somehow, simultaneously, they were both dealing with a profound change in attitude toward the environment, each injecting into it the importance of the point-of-view, which was to completely overturn the traditional world-view of the Renaissance and transform our understanding of human interaction.

What model of reality is emerging from those points of departure, from the rest of the artistic experimentation of the 20th century? What is the paradigm that art and science are proposing? What will the new visual space of our culture look like? In response to those questions, I think we can honestly say that the artistic and scientific revolutions of our century are far from finished. The model or models they will eventually propose are still in development. The defining process, which has been going on for over a century, is not complete and will not be for another fifty years. When that space is finally defined it will provide the schema of how we operate. We have already seen some of the clues coming from both art and science as to what it might look like. That space, like the preceding space of the Italian Renaissance, will be our visual space, our communication space, an organizational space, the space of how we imagine reality. It has been anticipated by artists since the Impressionists, defined by science starting with the Theories of Relativity and Quantum Physics and made habitable by artists again during the course of the century as it is gradually integrated into our cultural consciousness.

The first revolutionary event in the process was the arrival of space-time. Throughout the history of art in the Western world, time was not a real factor and space was a static thing, time arrested. At the beginning of our century artists were very concerned, just as science, by the notion of duration, what was called the 4th dimension, and movement. The period that Duchamp referred to in the beginning of this article was the same as the discovery of space-time. In the plastic arts there were many attempts to capture movement, especially by the Italian Futurists. Duration became a dimension applied to painting and sculpture allowing for change over time. Artists explored the passage of time permitted by cinema and experimental film was born. Technological change promoted the eventual transformation of experimental film into video art, the manipulation of the image in time, the artistic exploration of the new entity, space-time. The access to duration that this allowed also led to another important synthesis in the arts that of image and sound. The new space became an audio-visual space. The concept of space-time brought a synthesis between the plastic arts and the performing arts as never before as people in both fields looked for collaboration in expanding the artistic space-time.

The role of the observer, as already said, has become central to the 20th century and its place in science confirmed through both Relativity and Quantum Physics. It is less thought of as central to the art of the century, but, from the beginning, artists have played with that idea which Duchamp summed up as the two poles of art, artist and spectator, of equal importance to the completion of a work and it's becoming art. The idea of participation of the spectator has been explored throughout the century in many forms, the vaguely reflecting surfaces of Malevich's paintings, the Grand Verre of Duchamp. Abstraction can be considered as the space for the spectator, permitting him or her to complete the work. Other art works were more literally dependent on the spectator to finish by adding his presence. Later pieces reacted in more and more complex ways as technology provided means of detecting that presence. Video cameras finally brought visitors into the work itself and made their reactions central to the artist's proposition. Interactivity became central to art.

Technology and Art

As artists began to use the new technologies, a new kind of art form emerged, different forms of so-called technological art. The name is ugly and misleading, substituting the tool for the topic. The artist simply took up different means as they became available, and by doing so explored the technologies in ways that were very often far from the intent of

the original product. The artist saw in many of the new systems the possibilities of creating that were only dreamt of a short time before. The manipulation of time and space, process, duration, interactivity, have all become important underlying elements in the art of our century, art using the new technologies. They have become an integral part of art just has they had already become the very heart of 20th century science. Marshall McLuhan described it,

"the serious artist is the only person able to encounter technology with impunity, just because he is an expert aware of the changes in sense perception"[6].

Artists understood the implications of the new systems because they saw their multi-layered application to the human environment, and not a single-purpose tool. In working directly with the new tools of communications they have helped create the new communications space which is the technological representation of the visual space we have been discussing.

Technology creates tools for a specific purpose responding to a specific demand. The artist finds other uses for those same tools by making them do things beyond what they were constructed to do, and in doing so, advances the human application of the technology. He socializes machines and technology by discovering an esthetic use for them, sometimes creating new demands for machines to which engineers must respond. This fact has been demonstrated over and over again in the field of electronics. Artists first entered there in a spirit of play, the safest and surest way of overcoming our natural intimidation to a complex technology. The second step has been the mastery of the technology through experimentation and production. Finally we find the artist actually inventing, or collaborating on the invention of new systems in order to respond to his creative needs.

Each of those stages has its concrete results which clearly identify the different levels of evolution of this form of creativity. In the first phase both the artist and the public are surprised by the results, both amazed by the nearly accidental discoveries of the artist, images and forms never before seen. The second phase demands more sophistication on the part of artist and spectator where the technology is mastered and consciously used by the artist to achieve what he has set out to create. Here is when we can begin talking about style, prowess, technical mastery, the things that comprise the signature of the individual artist. Here too, he generally begins to understand the limitations of the technology and starts his move to stage three, developing extensions of the technology to satisfy his creative demands.

At this point, artists and their work should become meaningful to the technological evolution of a communications system – and the industry that created it – since, through artistic innovation the real integration of the technological system into the human environment has begun. It is no longer a passive tool serving predetermined human needs, but an active system evolving as man evolves, an integral part of human culture. This interaction between the creativity of the artist, the evolution of a technological process and the reaction of the public represents a new form of relationship between these entities, providing new experimental potential for exploring the future of these new systems as we attempt to define them.

The work of certain artists vis-à-vis the media has continued the process of building the new space by working directly with the new tools of communication. Nam June Paik, considered the founder of video art in the '60's, through his work brought us to understand and accept certain elements of television in a radical new way. First of all, through the distortion of the image he brought us to see the plasticity of the electronic image and to understand that it was a processed image and not some kind of neutral transmission of reality. It was reality reworked and it could be reworked even further. Paik's early work, such as *Global Groove*, presaged international satellite broadcasting and even zapping on a global scale. His work and that of others like him began a long process, far from finished, of reevaluating a communications medium holding an important place in our lives. Video effects developed first by artists unknown to the general public made new imagery an everyday television occurrence. Television, because it has generally denied the forms of artistic creativity that could help it find its cultural specificity, is still rebroadcasting other cultural forms rather than inventing new ones that might more fully express its cultural potential. This is the continuing lesson of video art which can be applied to other communication tools as they arrive.

[6] Marshall McLuhan, Understanding Media, New York 1964, 33

From the very beginning of telecommunications, artists were intimately involved in the process of invention. It should not be forgotten that Samuel Morse, the inventor of the telegraph, was a painter. More to the point, in our century other artists have extended the communication potential of existing tools through their personal experimentation. Scriabine invented the concept of multi-media with his Synesthetic light and music concerts in the early 1900's. Laszlo Moholy-Nagy, a founder of Bauhaus, did the first painting over phone lines in 1922, Man Ray, the first transmitted fashion photographs in 1926. Appolinaire and Edgar Varese proposed theatrical works for the radiophonic space of the 1920's and 1930's.

By the 1960's, 'Experiments in Art and Technology' (EAT) brought together engineers and artists such as Billy Kluver, Robert Rauschenberg, Lucinda Childs, John Cage in collaborations and performances that broadly used radio and other media. The musician Robert Moog invented the audio synthesizer in 1964 and Nam June Paik, the first video synthesizer in 1967. By the 1970's and 80's, the widening use of communications media made interactivity more and more an artistic reality. In the 90's telecommunication advances made that interactivity possible over long distances. Other artists, such as Woody and Steina Vasulka have worked to enlarge the potential of the space even adding elements of artificial intelligence to make it more reactive.

In general, the work of all these artists has led us to understand space-time and its potential for interactivity. They have taken us into the new communication space with which we are now confronted and have helped us assimilate it. The synthesis between the performing and plastic arts referred to earlier has become a staple. Music, dance and theater are space-time and interactivity which makes them natural candidates for an interactive network. Dance reinvented space and pushed to the limits what the technology could add to that space and is still doing so. The fact that the exchanged image is electronic means that it can be manipulated, reworked in evolution with the performance and the entire physical, virtual, audio-visual experience must be considered as a complete ensemble in total collaboration. We have arrived at a point today where the representation of space is both live and plastic permitting experimentation in real-time with all the dimensions of space-time.

The communication technologies today permit a fuller exploration of the potential of this new space and the possibility of finding out what the word interactivity really means. The reality of the machine has finally caught up with the creative imagination of the artist. That makes those technologies an expression of the values that we are attempting to define as we reinvent our society according to the new artistic and scientific givens. The flux of civilization produces the ideas that produce the tools for the realization of the ideas. In the use of those tools we can see the organizational patterns that are becoming the institutional expression of our future society. The network is a prototype of the socio-politico-cultural organization of the future. For that reason, it is important to understand its functioning, and to avoid applying to it outdated or irrelevant procedures derived from other media, technologies or cultural habits.

Network Space, Experimenting the Paradigm

Science, and by extension technology, solves problems. Art creates them. Science answers questions, art poses them. The two circle the central questions of a society in different directions making them seems as opposites when they are not. Every mode of communication has at one of its extremes a form of expression we call art. Art, being the densest form of communication, is often the supreme test of any means of communication. Each work of art contains the entire world-view of the artist and, as such, demands of any means of expression the dimensions necessary to fulfill that need. Art questions that communication process to probe its potential to find out what it can say about the human condition in relation to the changed environment caused by the new means of communication.. Art is the procedure by which we test a communication system, and by doing so, the reality of the relational context it proposes.

The new technologies of the emerging visual environment have always presented a particular challenge to the artist; to adapt these tools to the process of artistic expression, to define their content, to develop visual languages, to construct the new communication space that will be virtual, international and interactive. It is the role of the artist to help define that space, to make it livable and a part

of contemporary culture. This was equally true of television which has only marginally been tested by the artistic process. While video art exists, with its 30-year history, its recognized practitioners and its presence in a growing number of art schools and museums, its influence is minimal given the enormity of the medium and its impact on society today. The same could happen with the network space. The form of investigation inherent in art could be as absent from it as it has been from television. The traditional role of art has been to renew the visual environment, to redefine it for each new era, and through doing so, provide society with models of action. What McLuhan and many others have meant by the education of perception by the artist. Simply put, art is a form of questioning and the interface between public and art is culture. The media may influence culture profoundly, but not in the same sense as art and, unfortunately not in the sense of culture suggested earlier, the integrated pattern of human knowledge.

But let us step back again in an attempt to imagine what the new visual space will look like. If we could already see it clearly and understand how it functions, we would be through the period of transaction and living with the new visual references and the operational schema it represents. We're not. We have seen many words attempting to define its parameters, space-time, duration, process, the role of the observer, interactivity, collective world-views, artistic synthesis and collaboration. There is the unique existence of the individual in the new space but the individual related to others and finally to the whole we call society. The network that we are building today from a synthesis of video, computer and telecommunication technologies is potentially the model for that space, calling into question many of the values that have been taken for granted in our society. The wide-spread use of the web has exposed much of the down-side of individualism for what it really is, chest-pounding showing off in the guise of communication, an ego-centric exposé rather than genuine interactivity. Many users of social networks talk 'at' the world and not with it. The broadcast model with its one-way transmission is still the predominant model, but now everyone can reach a mass audience. This may be interesting economically, but it is a simplistic view of interactivity and what the network model proposes. In order for real interactivity to take place, a hard look at what it means becomes essential. Very important or unique individuals or institutions remain unique – alone – on the network. The top of the pyramid is a lonely place. If real interactivity is to take place, partnerships are essential. A network demands a minimum of two. Vertical hierarchical organization gives way to horizontally connected structures.

The profound change in western thought and society that this organizational change represents can be called a new renaissance in the sense that it is a rupture with the formulations of the past equal to that of the 15th century which introduced to our culture the Euclidean space of Italian perspective and its organizational values. That visual space has since become the dominant intuitional space of our culture. In the 20th century that situation changed radically first through a rejection of the organizational schema of the mechanical universe and then by proposing a new paradigm still being defined. If, indeed we are living a new renaissance, the need for redefining all aspects of our society is what we are living. This includes the invention of a new geometry to describe coming visual space. Happily, in a neat parallel with the new tools of communication, we have a new geometry which allows us to visualize the new space and better understand its functioning in all its complexity, the fractal geometry, discovered by Benoit Mandelbrot, of the complex systems proposed by Chaos Theory.

In a network everyone is connected directly with everyone else, on a one-to-one basis, without going through any other point (person). While a signal may travel through several sites and switchers to arrive at the desired point, the psychological and sociological reality of connection is direct one-to-one communication. This possibility of everyone being connected to everyone multiplies the number of potential one-to-one connections rapidly, and the addition of any new member increases enormously the number of those connections. As the number becomes larger, tending toward infinity, the pattern slides away from that of a complex line on the surface of a sphere and approaches that of a spherical plane. An infinite numbers of connections contained in a finite space. The dimension must be spherical, between one – a line – and two – a plane, thus fractal. In the network we have, in fact, two geometries superimposed, classical spherical geometry which

described the actual network cabling and a fractal description of its functioning, the geometry of its use. This may be same as the operation of the mind with one geometry describing the neuronal connections and another their sum – the mind itself. And just as the human mind is made up of the fractal form of its operation imposed on the classical form of its circuits between communicating centers, society may be said to be constructed in the same manner. This is an image. By trying to visualize the operation of the network we start to develop an image of network space that is the beginning of what our future visual space with look like. To make that space a part of culture and the intellectual reflex of the individual members of society, an enormous amount of artistic experimentation and proposition is essential.

The space-time that seems to be emerging from the 100 years of experimentation is not fixed but one whose evolution is part of its definition. This examination of art brings us to realize that both art and science have been laboring with the notion of interactivity. The clues have been persistent and multiple: process – moving away from the object to the process of production; duration – existing in time; multiple points of view – interactivity, complementarity, systems… Art and science have in fact been defining the new space and establishing it as a governing concept, as a paradigm for action for several generations. It is interactive containing multiple points of view. The observer as actor, actor as observer. Our cultural reality will be found in the collection and communication of those several points of view. The space-time geometry of this space is becoming clearer and will eventually replace the Euclidean geometry of the past in the western imagination.

The spirit of the times is interactivity. There is a general sense that trans-disciplinarity is good, that collaboration is essential, the federation of the means of experimentation, of exploration, of production a desirable goal. Science is searching for more interdisciplinary approaches to questions, artists for more joint collaboration across specializations. More and more people accept the network format as a structural good. Everyone is looking for the larger picture and it is coming into focus. The important thing is that we keep that 'looking' as open as possible recognizing that the outline of the new space must be drawn from all forms of knowing, artistic and scientific, meaning recognizing what those forms of knowing are and directing resources to permit them to reach their potential.

Each work of art, each scientific explanation, each piece of knowledge is like a piece of a holographic plate in the same fashion that each work of art is a piece of the artist's plate – his or her world-view. While looking through each piece, with help, we can see the whole of the concept developing, glimpse the pattern evolving from what art and science are proposing and begin to understand the emerging world-view. We begin to understand the shape of the new space – the new paradigm – to see it as process, a space that is interactive, defined by that interactivity, with a geometry of its own taking into account multiple points of view and functioning like a circuit between them all. The coming paradigm will entail change in many definitions, news roles and professions, new organizational structures, and new visions of our environment. This is the still fuzzy image that will eventually replace the perspective of the Renaissance in which we have lived up to now. The network as interactive space will become the metaphor for our civilization much as the clockwork machine was for that earlier era. Its geometry will be for us what the Euclidean geometry of the Renaissance has been, the visible form of our imagination.