

The Network Metaphor: New Communication Space

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Introduction

Webster's Dictionary defines culture as 'the integrated pattern of human knowledge, belief and behavior that depends on the capacity for learning and transmitting knowledge to succeeding generations'.¹ Culture, often understood as the sum of artistic creation, is the sum of knowledge of a society and things other than art form an integral part of it, notably science. To exclude the world view of science from culture is as myopic as eliminating the artistic vision from knowledge. The need to create reality or realities from environmental stimuli—all of which are representations and therefore virtual products of our imagination—is fundamental to mankind. It is a form of knowing, attempting to understand, and art and science even in their most primitive earlier forms codified and transmitted it from generation to generation. This process is the same as building models, constructing some limited form or expression of reality from received givens, and 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.

Artists reveal the evolution of the psychological environment of their era, often anticipating the changes coming in society. 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 or her 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 a 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 twentieth century. The artist is a kind of social researcher applying his or her creative intuition to the condition of man in order to discover, as another scientific great of our era, Niels Bohr, described it, 'the relations between the manifold aspects of our experience'.³ Through their work artists comment and critique, judge and debate, evaluate the human condition—the analysis of man in his environment from the interior of the individual creator. This is the artist's role within reality as defined by another physicist, John Wheeler, student of Niels Bohr, who said that 'reality is the joint product of those who communicate',⁴ 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. The artist is an observer and art is communication and thus an important part of that 'joint product', communication from the individual to the collective, that is, the sum of individual realities—culture in its anthropological sense as well as transmission of knowledge.

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 (by 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. 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

1 'Culture' (*Merriam-Webster Dictionary*) <<https://www.merriam-webster.com/dictionary/culture>>.

2 Werner Heisenberg, *Physics and Beyond* (George Allen & Unwin Ltd 1971) 109.

3 Niels Bohr, *Atomic Theory and the Description of Nature* (first published 1934, AMS Press Inc 1978) 18.

4 (1985) 37 *Johns Hopkins Magazine* 5.

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 acts of appreciation and interpretation. The observer forms part of the indispensable interactivity that is art. Duchamp regarded a work of art as having two poles, the artist and the spectator, each equally participating in the definition of a work.

What model of reality is emerging from those points of departure, from the artistic experimentation of the twentieth 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 the past century are far from finished. The model or models they will eventually propose are still in development but becoming more evident. 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 prior space of the Italian Renaissance, will be our visual space, our communication space, an organisational 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 has gradually been integrated into our cultural consciousness.

Models as visual space

If we accept the parallel between art and science as two sources of knowledge, looking at them as an ensemble can provide us with complementary information. The models of reality proposed are from radically different approaches. Science is concerned with building concepts from observed facts and artists work from individual concepts to create new artefacts. 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 glass contains the whole object—the worldview of the artist. Each piece of the plate is distinct in itself but each contains the entire image and not a fragment of it. That image/object is the artist and his or her vision, filtering, funneling, concentrating what he or she has pulled from the surrounding world—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 presented by that combined whole.

We can understand this process by imagining the worldview 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. It 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 recognise 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, all of the ways we converse and exchange information—word of mouth, newspapers, radio, television, cinema, and now the net—form a space in which we see ourselves reflected. It is from that communication space that we learn how to act toward others, where new members learn what society proposes, and where the unspoken rules of society are demonstrated. The domination of this space by the media, and now social media, is basically a twentieth-century phenomenon which we are now finally beginning to understand can have very negative consequences. These are issues which need to be addressed. The communication space, which is very real, is fundamental to how our society operates. What creates and recreates that space is important to how we continue to function, particularly at a time when so much change is happening.

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 organisational space as well. We construct the communication 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, organisational 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 to give 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 worldview of the dominant ideology rather than set out on its own. But science explains how things work, not why. Culture supplies the 'why', and when society pretends that this isn't the case, it usually means that science has been misappropriated.

When Western civilisation accepted science as the exclusive means of defining the material universe, it was natural that it influenced art to a tremendous degree. First, it was a source of new metaphors, but also many of the artistic discoveries of our century did parallel those of science: space-time, interactivity, observer-created reality—art engaged with this material universe, asking the questions about what it means to us and how 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.



Fig 1. Organisation of Graphic Motifs III (Frantisek Kupka 1912–13).
Courtesy of the Pudil Family Foundation.

Anticipating fractal geometry? Benoit Mandelbrot, the inventor of that geometry, introduced me to this painting as an example of a fractal in art. Coming from video, I recognised it as video feedback, the result of a camera filming itself. What inspired Kupka to paint a discovery in maths and art which came 60–70 years later?

Network space: Experimenting with 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 seem as opposites when they are not. Every mode of communication has at one of its extremes a form of expression we call art. As it is the densest form of expression, art is often the supreme test of any means of communication. Each work of art contains the entire worldview of the artist and, as such, demands of any means of expression the dimensions necessary to express that. Art questions that communication process 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. 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. It is what Marshall 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 the 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. The media are an expression of the anthropological definition of culture—how people act.

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 transition and living with the new visual references and the operational schema they represent. We're not, but it's beginning to take shape. We have seen many words attempting to define its parameters: 'space-time', 'duration', 'process', 'the role of the observer', 'interactivity', 'collective worldviews', 'artistic synthesis', and 'collaboration'. There is the unique existence of the individual in the new space, but also the individual related to others and finally to the whole we call society, not as a singularity but as a singularity embedded in a network of relationships. 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 widespread use of social media has exposed the downside of individualism: that it encourages chest-pounding in the guise of communication, an egocentric exposé rather than genuine interactivity. Many users of the web 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 organisation gives way to horizontally connected structures.

The profound change in western thought and society that this organisational change represents can be called a new Renaissance. It is a rupture with the formulations of the past equal to that of the fifteenth century, which introduced to our culture the Euclidean space of Italian perspective and its organisational values. That visual space has since become the dominant intuitional space of our culture. In the twentieth century that situation changed radically, first through a rejection of the organisational schema of the mechanical universe, and then with the proposal of a new paradigm still being defined. If indeed we are living in a new Renaissance, what we are currently experiencing is the need for redefining all aspects of our society and reinventing our social institutions. This includes the invention of a new geometry to describe the coming visual space. Happily, in a neat parallel with the new tools of communication, we have a new geometry which allows us to visualise the new space and better understand its functioning in all its complexity: the fractal geometry of complex systems.

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 switches 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

number of connections contained in a finite space. The dimension must be spherical, between one—a line—and two—a plane—being therefore fractal. In the network we have, in fact, two geometries superimposed: classical spherical geometry which describes the cabling of the network, and a fractal description of its functioning, the geometry of its use. This may be the 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 the circuits between its communicating centers, society may be said to be constructed in the same manner. This is an image. By trying to visualise the operation of the network we start to develop an image of network space that is the beginning of what our future visual space will 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 social space-time that seems to be emerging from the last 130 years of experimentation—what I call a new Renaissance—is not fixed but one whose evolution is part of its definition. This examination of the art of our lifetimes brings us to realise 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; connectivity; empathy; 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. The observer as actor and actor as observer. Our cultural reality will be found in the collection and communication of those definitions that will eventually add new dimensions to the Euclidean geometry of the past in the western imagination.

Institutional experimentation

Individual artists have been exploring and building the new space for many years, and not always with the full understanding of the cultural establishment. For myself, it has been 40 years of working with art and the telecommunications network as a new space to be experimented with. Art history has often overlooked the relation between art and science, reflected in a remark I heard from a French bureaucrat in the 90s when explaining the relation between the two: ‘Monsieur, we are the Ministry of Culture, science doesn’t interest us’. When the issue is discussed at all, it is mistakenly understood as art and technology, that is, the tools and not the deeper meaning of parallel paradigms. It is important to see the cultural transformation in both, side by side, in order to understand what in fact our civilisation has been confronting and where it is going. Now that it is clearer, an institutional mobilisation is essential to integrate this change into our education system and cultural lives, to bring more energy into exploring its implications and potential, and to deal with the transformation in how we see and understand reality even though the process is an open one. I am a network optimist from the 80s, when we saw the cultural potential of the emerging technology, only to see it kidnapped by commerce in the 90s and transformed into the distorting communication space it is today: one based on advertising and identity theft.

It is essential to recognise the new world being created around us and recuperate and redirect the tools of communication to make them a better expression of the best of our culture. The evolution of Western civilisation—and today we must talk rather about world civilisation—is dependent on its communication environment. If we are to have a genuine cultural presence in that environment, based on real knowledge and the accumulated intelligence of

mankind, encouraging collaboration from all aspects of society to address the problem, to explore the new communications space together, is essential. Implicit in this is the redefinition of roles and objectives. If we are living a new Renaissance it is normal that we do so. Communication and commerce is what links the individual to the whole, and all players, even in seemingly unrelated fields, must be brought together to understand the critical importance of addressing that change. If culture is absent from that mix, then commerce becomes the culture.

Another parallel may exist with science and provide a key to a better understanding of the process of artistic creativity. We can consider art in the same light as science, with a spectrum of activity ranging from fundamental research to applied research on a continuum containing all the various forms of creativity and artistic practice. Fundamental research could be considered the pure artistic creation of an individual artist or group of artists without any outside direction or imposed objective. It is a response to the need to create as defined above, arising from the need to know, the need to build models of reality. Applied research would be the applied arts, for instance design, a principally commercial application of the creative disciplines for specific clients and a pre-defined objective. Wherever the pointer falls along the line connecting the two is again very subjective for the creator but it is the same line. On the fundamental end there is building of models of reality. On the applied arts end, the translation of those realities into socially useable forms.

Pure artistic creativity is the means by which the language of the applied arts is constantly renewed. The experimentation implied in the idea of fundamental artistic research leads to renewal, to innovation and discovery, which filters down to influence and change other forms of creativity. For people who work in the arts, their personal position along the spectrum is again subjective and the divisions we know today are institutional, not personal. Many artists spend careers sliding up and down, or across the spectrum of creative possibilities, some through personal desire, others because of economic necessity. Even within institutions the frontier between the various divisions is very blurred and often counterproductive and, too often, does not correspond to the desires of the creators themselves. The point is that the applied arts, the commercially viable and therefore more readily understandable aspect of creativity, would not evolve, would not surprise, would not be effective if they were not renewed by the experimentation that takes place in the areas of fundamental artistic research. The changing worldview proposed by the ensemble of artistic experimentation and production of a particular moment is manifest in the applied arts, which help communicate it to the general public. Again, this is one of the ways that artistic ideas get transformed into what we understand as culture.

I created the MARCEL network 20 years ago to explore that potential, to bring artistic experimentation permanently into the network space to try its potential, to learn how to work artistically in that new space, to develop the tools necessary to do so and to learn the protocols.⁵ It became very obvious very early on that we would never have the necessary tools from industry, because they are usually not commercially viable. This is why multipoint connectivity was mostly invisible until the pandemic made it obligatory. But connecting is not enough. We need to learn how to use the space and build the tools to let us use it to its fullest. Our goal in MARCEL has been to drive technological evolution through the demands of art and not technological or commercial whim looking for the

⁵ ‘Welcome to Marcel’ (*Multimedia Art Research Centres and Electronic Laboratories*) <<http://www.mmmarcel.org/>>.

next fad. Many interesting efforts are being made in the network everywhere in culture—art, science, research and education—but in a fragmented way which needs to be brought together in a coherent fashion. We need a part of the network to be transformed into a non-commercial, publicly owned entity, working for the common good of culture and developing the legal framework for governing it. Again, people are working on this idea, and those efforts need to be unified, the space and its objectives identified and agreed to with a judicial framework for making it a recognised part of contemporary society. We need an economic study of its viability, how it can remain non-commercial while allowing artists for instance to earn a living from it, as all other researchers do.

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, exploration, and production a desirable goal. Science is searching for more interdisciplinary approaches to research, artists for more joint collaboration across specialisations. If I am correct about our living a new Renaissance, we must reinvent our social institutions based on a new operational schema, which is the interactive network. 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 knowledge, artistic and scientific, meaning recognising what those forms of knowledge are and directing resources to permit them to reach their potential.

The manipulation of time and space, process, duration, interactivity, have all become important underlying elements in the art of our times, art using new technologies. They have become an integral part of art just as they had already become the very heart of twentieth-century science. McLuhan described it thus: '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. Because the technology continues to evolve, the artistic experimentation must also continue to evolve.

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 that technology. Artists socialise machines and technology by discovering an aesthetic 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 sense of intimidation towards 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 or her creative needs.

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

⁶ Marshall McLuhan, *Understanding Media* (Signet 1964) 33.

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.

In general, the work of many contemporary artists has led us to understand space-time and its potential for interactivity. They have taken us into the new communications space with which we are now confronted and are helping us assimilate it. The synthesis between the performing and artificial arts referred to earlier has become a staple. Music, dance and theatre are space-time and interactive which makes them natural candidates for an interactive network. Dance and theatre reinvented space and pushed to the limits what technology could add to that space and they are still doing so. The fact that the exchanged image is digital means that all elements 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 artificial, permitting experimentation in real time with all the dimensions of space-time.

The emerging network paradigm will entail changing definitions, new roles and professions, new organisational 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 civilisation, much as the clockwork machine was for that earlier era. Its geometry will be what the Euclidean geometry of the Renaissance has been for us, the visible form of our imagination.

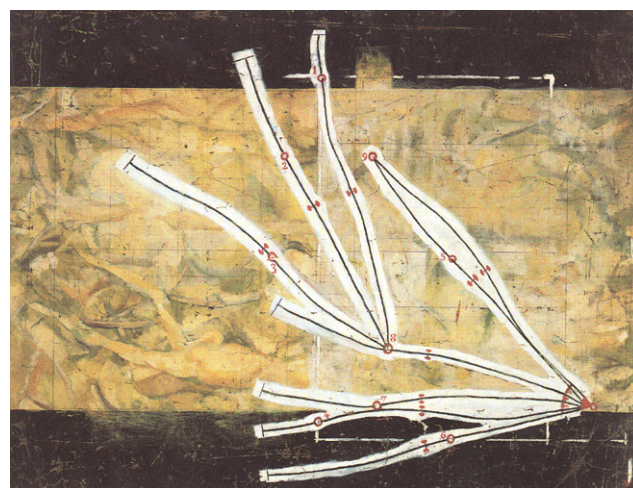


Fig 2. Réseau des stoppages (Marcel Duchamp 1914). Courtesy of the Duchamp family.

Duchamp created his 'stoppages' by dropping a metre-long piece of string from the height of one metre three times, tracing the lines to produce alternative metres. alternative ways of measuring the world. In 1914 he put them in a network (réseau) possibly suggesting collective points of view.